





22102077792

Med
K3820







81627

NEW ILLUSTRATED NATURAL HISTORY OF THE WORLD

BY

ERNEST PROTHEROE, F.Z.S.

AUTHOR OF "THE HANDY NATURAL HISTORY," ETC. ETC.

WITH 24 COLOURED PLATES (73 FIGURES)
AND NEARLY 300 PHOTOGRAPHS DIRECT FROM NATURE
CHIEFLY BY W. S. BERRIDGE, F.Z.S.



LONDON
GEORGE ROUTLEDGE AND SONS, LTD.
NEW YORK: E. P. DUTTON AND CO.

11572

UNIFORM WITH THIS WORK

Each 7/6 net; half-morocco, gilt, 10/6 net

British Birds in their Haunts. By Rev. C. A. JOHNS, F.L.S.
Edited by J. A. OWEN. 64 Coloured Plates (256 Figs.) by WILLIAM FOSTER.

British Butterflies and Moths. By Dr. W. E. KIRBY.
70 Coloured Plates, containing figures of all the larger Lepidoptera, many Caterpillars and Chrysalides, and 4 Plates of Microlepidoptera.

British Ferns and their Varieties. By C. T. DRUERY, F.L.S.
40 Coloured Plates, numerous text-cuts, and a gallery of 96 plates of varieties.

Flowers of the Field. Edited by CLARENCE ELLIOTT.
92 Coloured Plates (268 Figs.) by E. N. GWATKIN.

New Illustrated Natural History of the World. An entirely original work by ERNEST PROTHEROE, F.Z.S. 24 Coloured Plates and nearly 300 photographic text illustrations from Nature chiefly by W. S. BERRIDGE, F.Z.S.

British Fungi. By GEORGE MASSEE, of the Kew Gardens.
40 Coloured Plates by Miss MASSEE. [Shortly.]

British Trees and Shrubs. Edited by E. T. COOK.
Coloured Plates and text-cuts. [Shortly.]

Round the Year with Nature. By W. J. CLAXTON.
Profusely illustrated. [Shortly.]

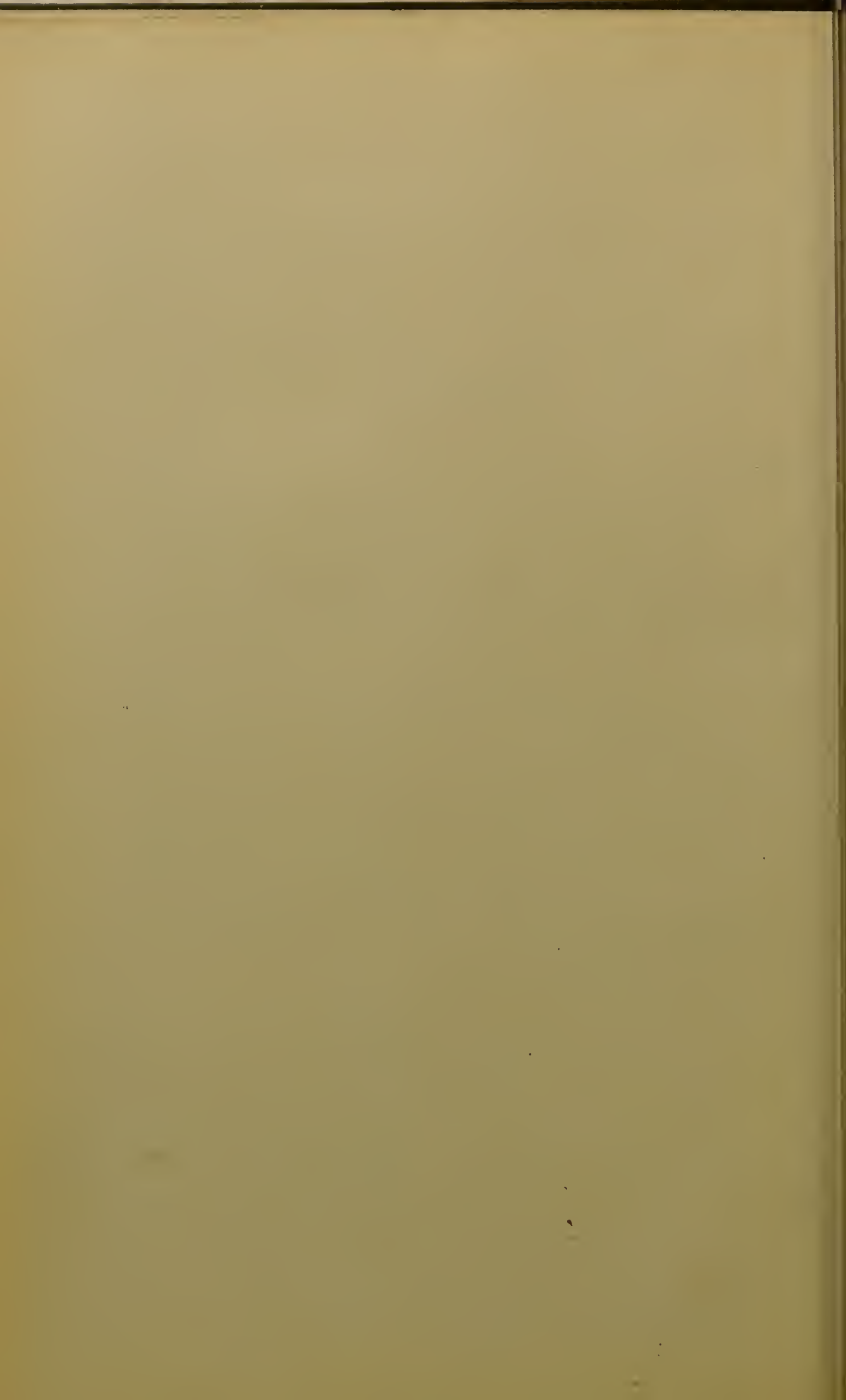
GEORGE ROUTLEDGE AND SONS, LTD.

1487 894

WELLCOME INSTITUTE LIBRARY	
Coll	welMOMec
Call	
No.	Q4

PREFACE

THE author is sensible of the honour conferred upon him in being requested to write a volume to replace the late Rev. J. G. Wood's "Popular Natural History." Public estimation of that work was marked by the many editions and the various shapes in which it made its appearance from time to time. A growing taste for Natural History, no less than the necessity to utilize the great additions to modern zoological knowledge, render excuse unnecessary for the present volume. It is as comprehensive as a compact form will permit; and a scientific classification has been adopted without overloading the subject-matter with intricate technicalities. Of the twenty-four coloured plates, nineteen are by Mr. W. S. Berridge, F.Z.S., and five by Mr. William Foster. The numerous illustrations in the text are in all cases photographs direct from Nature by Mr. Berridge, except the seven figures on pages 509-12 and those otherwise acknowledged.



CONTENTS

INTRODUCTION	Pages 1-5
------------------------	-----------

VERTEBRATA

CLASS: MAMMALIA (Mammals)

ORDER: PRIMATES (Man and the Monkey Tribe)

SUB-ORDER: ANTHROPOIDEA

<i>Family</i> Simiidae	Gorilla—Chimpanzee—Orang-Utan—Gibbons	
„ Cercopithecidae	Hanuman Monkey—Guerezas—Proboscis Monkey—Guenons—Mangabeys—Macaques—Baboons	
„ Cebidae	Spider Monkeys—Capuchin Monkeys or Sapajous—Howling Monkeys—Sakis—Douroucolis	
„ Hapalidae	Marmosets	Pages 6-35

SUB-ORDER: LEMUROIDEA

<i>Family</i> Lemuridae	True Lemurs—Mouse Lemurs	
„ Lorisidae	Galagos—Lorises	
„ Tarsiidae	Tarsier	
„ Chiromyidae	Aye-Aye	Pages 35-39

ORDER: CHIROPTERA (Bats)

SUB-ORDER: MICROCHIROPTERA (Insect-eating Bats)

<i>Family</i> Vespertilionidae	Pipistrelle Bat—Long-eared Bat
„ Rhinolophidae	Greater Horseshoe Bat
„ Phyllostomatidae	Vampire Bat

SUB-ORDER: MEGACHIROPTERA (Fruit-eating Bats)

<i>Family</i> Pteropodidae	Indian Fox Bat—Kalong—Australian Fruit Bat	Pages 40-46
--------------------------------------	--	-------------

ORDER: INSECTIVORA (Insect-eaters)

<i>Family</i>	Erinaceidæ	Hedgehog	
„	Talpidae	Mole	
„	Soricidæ	Common Shrew—Pigmy Shrew—Water Shrew	
„	Macroscelididæ	Elephant Shrews	
„	Centetidæ	Tenrec	
„	Tupaiidæ	Tree Shrews	
„	Galeopithecidæ	Cobego, or Flying Lemur	<i>Pages 46-55</i>

ORDER : CARNIVORA (Flesh-eaters)

SUB-ORDER : FISSIPEDIA (Land Carnivores)

<i>Family</i>	Felidæ	.	.	.	Cat Tribe : Lion—Tiger—Leopard Ounce—Jaguar—Puma—Ocelot— Serval—Fishing Cat—Wild Cat— Domestic Cat—Lynxes—Cheetah	
„	Viverridæ	.	.	.	Civets—Genet—Cynogale—Mongoose	
„	Protelidæ	.	.	.	Aard Wolf	
„	Hyænidæ	.	.	.	Hyænas	
„	Canidæ	.	.	.	Dog Tribe : Wolves—Jackals—Wild Dogs —Domestic Dog—Foxes—Fennec	
„	Mustelidæ	.	.	.	Weasel Tribe : True Weasels (Marten, Sable, Polecat, Weasel, etc.)—Wolverene —Skunks—Zorille—Badgers—Otters	
„	Procyonidæ	.	.	.	Raccoon—Coaitis—Kinkajou	
„	Ursidæ	.	.	.	Bears	Pages 55-108

SUB-ORDER : PINNIPEDIA (Marine Carnivores)

<i>Family</i>	Phocidæ	.	.	.	Earless, or True, Seals—Sea Elephant	
„	Otariidæ	.	.	.	Eared Seals—Sea Lion—Sea Bear	
„	Trichechidæ	.	.	.	Walrus	Pages 108-118

ORDER : RODENTIA (Gnawing Animals)

SUB-ORDER : SIMPLICIDENTATA

<i>Family</i>	Sciuridæ	.	.	.	Typical Squirrels—Flying Squirrels —Ground Squirrels—Marmots	
„	Castoridæ	.	.	.	Beaver	
„	Dipodidæ	.	.	.	Jerboa	
„	Pedetidæ	.	.	.	Cape Jumping Hare	
„	Muridæ	.	.	.	Mice — Rats — Voles — Musquash — Hamster—Lemming	
„	Myoxidæ	.	.	.	Dormice	
„	Hystriidæ	.	.	.	Porcupines	
„	Dasyproctidæ	.	.	.	Agouti	
„	Caviidæ	.	.	.	Guinea Pig—Capybara	
„	Chinchillidæ	.	.	.	Chinchilla—Viscacha	Pages 118-139

SUB-ORDER : DUPLICIDENTATA

<i>Family</i>	Leporidæ	.	.	.	Hares—Rabbits	Pages 140-143
---------------	----------	---	---	---	---------------	---------------

ORDER : UNGULATA (Hoofed Animals)

SUB-ORDER : HYRACOIDEA

<i>Family</i>	Hyracidæ	.	.	.	Hyraces	Pages 143-144
---------------	----------	---	---	---	---------	---------------

SUB-ORDER : PROBOSCIDEA

<i>Family</i>	Elephantidæ	.	.	.	Elephants	Pages 144-148
---------------	-------------	---	---	---	-----------	---------------

SUB-ORDER : PERISSODACTYLA (Odd-toed Ungulates)

<i>Family</i>	Tapiridæ	.	.	.	Tapirs	
„	Rhinocerotidæ	.	.	.	Rhinoceroses	
„	Equidæ	.	.	.	Horse—Ass—Zebra—Quagga	Pages 149-157

SUB-ORDER : ARTIODACTYLA (Even-toed Ungulates)

GROUP : PECORA (Ruminating Animals)

<i>Family</i> Bovidæ . . .	Ox Tribe : Domestic Cattle—Wild Oxen —Yak—Bisons—Buffaloes—Musk Ox	
„ Ovidæ . . .	Domestic Sheep—Wild Sheep (Mouflon, Argali, Urial, Bighorn, etc.).	
„ Capra . . .	Domestic Goats—Wild Goats (Ibex, Mark- hor, Pasang, Tahr, Takin, Rocky Mountain Goat, etc.)	
„ Antilopidæ . . .	Antelopes : Chamois—Eland—Gemsbok —Beatrix Antelope—Nilgai—Sable Antelope—Dorcas Gazelle—Springbok —Waterbuck—Hartebeest—Blesbok —Gnus—Klipspringer—Duikers, etc.	
„ Antilocapridæ . . .	Prongbuck	
„ Camelopardalidæ . . .	Giraffes—Okapi	
„ Cervidæ . . .	Deer : Red Deer—Wapiti—Axis Deer— Sambar—Fallow Deer—Muntjac—Roe Deer—Reindeer—Elk—Musk Deer	
		<i>Pages 157–202</i>

GROUP : TRAGULINA

<i>Family</i> Tragulidæ . . .	Chevrotains	<i>Pages 202–203</i>
-------------------------------	-------------	----------------------

GROUP : TYLOPADA

<i>Family</i> Camelidæ . . .	Camels—Llamas	<i>Pages 203–207</i>
------------------------------	---------------	----------------------

GROUP : SUINA (Pigs and Hippopotamus)

<i>Family</i> Suidæ . . .	Domestic Swine—Wild Pigs—Wart Hog —Babirusa	
„ Dicotylidæ . . .	Peccaries	
„ Hippopotamidæ . . .	Hippopotamus	<i>Pages 207–215</i>

ORDER : SIRENIA (Sea-Cows)

MANATEES AND DUGONGS	<i>Pages 215–216</i>
----------------------	----------------------

ORDER : CETACEA (Whales and Dolphins)

SUB-ORDER : MYSTACOCETI (Whalebone Whales)

<i>Family</i> Balæntidæ . . .	Greenland Whale—Rorquals—Southern Right Whale—Humpback Whale
-------------------------------	---

SUB-ORDER : ODONTOCETI (Toothed Whales)

<i>Family</i> Catadontidæ . . .	Sperm Whale—Bottle-nose Whale	
„ Delphinidæ . . .	Narwhal—White Whale—Dolphin— Porpoise—Grampus	<i>Pages 217–224</i>

ORDER : EDENTATA (Toothless Animals)

<i>Family</i> Bradypodidæ . . .	Sloths	
„ Myrmecophagidæ . . .	Ant-Eaters	
„ Dasypodidæ . . .	Armadillos	
„ Manidæ . . .	Pangolins	
„ Orycteropidæ . . .	Aard-vark	<i>Pages 224–229</i>

ORDER : MARSUPIALIA (Pouched Animals)

<i>Family</i>	Macropodidæ	.	.	Kangaroos—Wallabies—Rat Kangaroo	
„	Phalangitidæ	.	.	Phalangiers or Australian Opossums : Cuscuses—Typical Phalangiers—Flying Phalangiers—Koala	
„	Phascolomyidæ	.	.	Wombat	
„	Peramelidæ	.	.	Bandicoots	
„	Dasyuridæ	.	.	Dasyures or Native Cats—Tasmanian Devil—Thylacine	
„	Didelphidæ	.	.	True Opossums	<i>Pages 229-241</i>

ORDER : MONOTREMATA (Egg-laying Mammals)

<i>Family</i>	Ornithorhynchidæ	.	.	Duckbill	
„	Echidnidæ	.	.	Echidna	<i>Pages 242-243</i>

CLASS : AVES (Birds)

SUB-CLASS : CARINATÆ (Keel-breasted Birds)

ORDER : PASSERES (Perching Birds)

SECTION : ACROMYODI (Singing Birds)

<i>Family</i>	Turdidæ	.	.	Thrushes — Redstarts — Redbreast — Nightingale—Chats—Wheatear	
„	Sylviidæ	.	.	Warblers (Blackcap, Whitethroats, Hedge Sparrow, Garden Warbler, Chiff-chaff, etc.)—Tailor Bird	
„	Fringillidæ	.	.	Grosbeaks (Red Cardinal, Greenfinch, Hawfinch)—True Finches (Chaffinch, Goldfinch, Linnet, Sparrows, Serin Finches, Bullfinch, Crossbill)—Buntings	
„	Paridæ	.	.	Tits	
„	Troglodytidæ	.	.	Wren	
„	Regulidæ	.	.	Gold Crest—Fire-crested Wren	
„	Alaudidæ	.	.	Skylark—Woodlark	
„	Motacillidæ	.	.	Wagtails—Pipits	
„	Hirundinidæ	.	.	Swallows—Martins	
„	Sturnidæ	.	.	Starling — Rose-coloured Pastor — Ox- Pecker	
„	Corvidæ	.	.	True Crows (Raven, Carrion Crow, Hooded Crow, Rook, Jackdaw)—Magpie—Jay— Nutcracker—Choughs	
„	Certhiidæ	.	.	Tree-Creeper—Wall-Creeper	
„	Sittidæ	.	.	Nuthatch	
„	Musicapidæ	.	.	Flycatchers	
„	Cinclidæ	.	.	Dipper	
„	Laniidæ	.	.	Shrikes or Butcher-Birds	
„	Oriolidæ	.	.	Orioles	
„	Ampelidæ	.	.	Waxwing	
„	Mimidæ	.	.	Mocking-Bird	
„	Ploceidæ	.	.	Weaver Birds—Whydah-bird	
„	Paradisidæ	.	.	Birds of Paradise	
„	Ptilonorhynchidæ	.	.	Bower Birds	
„	Menuridæ	.	.	Lyre Birds	<i>Pages 247-302</i>

SECTION : MESOMYODI (Songless Passeres)

„	Cotingidæ	.	.	Bell Bird or Campanero—Cock of the Rock	
„	Pipridæ	.	.	Manakins	<i>Pages 302-303</i>

ORDER: PICARIÆ (Woodpeckers, etc.)

<i>Family</i>	<i>Picidæ</i>	.	.	Woodpeckers—Wryneck	
"	<i>Rhamphastidæ</i>	.	.	Toucan	
"	<i>Cuculidæ</i>	.	.	Cuckoo	
"	<i>Halcyonidæ</i>	.	.	Kingfisher	
"	<i>Upupidæ</i>	.	.	Hoopoes	
"	<i>Meropidæ</i>	.	.	Bee-Eater	
"	<i>Bucerotidæ</i>	.	.	Hornbills	
"	<i>Caprimulgidæ</i>	.	.	Nightjar or Goatsucker	
"	<i>Cypselidæ</i>	.	.	Swifts	
"	<i>Trochilidæ</i>	.	.	Humming-Birds	<i>Pages 303-313</i>

ORDER: PSITTACI (Parrots)

<i>Family</i>	<i>Psittacidæ</i>	.	.	Grey Parrot — Owl Parrot — Cockatoos — Macaws—Parroquets—Love-Birds	
"	<i>Loriidæ</i>	.	.	Kea—Lories—Loriquets	<i>Pages 313-318</i>

ORDER: STRIGES (Owls)

<i>Family</i>	<i>Strigidæ</i>	.	.	Barn Owls	
"	<i>Bubonidæ</i>	.	.	Horned and Wood Owls	<i>Pages 318-321</i>

ORDER: ACCIPITRES (Diurnal Birds of Prey)

<i>Family</i>	<i>Pandionidæ</i>	.	.	Osprey	
"	<i>Falconidæ</i>	.	.	Peregrine Falcon—Merlin—Kite—Kestrel —Sparrow Hawk—Goshawk—Buzzards —Harriers—Harpy Eagle—Imperial Eagle—Sea-Eagles—Golden Eagle— Monkey-eating Eagle—Lammergeier	
"	<i>Vulturidæ</i>	.	.	Egyptian Vulture—Griffon Vulture	
"	<i>Serpentariidæ</i>	.	.	Secretary-Bird	
"	<i>Cathartidæ</i>	.	.	Californian Vulture—King Vulture—Con- dor	<i>Pages 322-336</i>

ORDER: STEGANOPODES (Cormorant Group)

<i>Family</i>	<i>Phalacrocoracidæ</i>	.	.	Cormorants—Darters	
"	<i>Sulidæ</i>	.	.	Gannets	
"	<i>Pelecanidæ</i>	.	.	Pelicans	
"	<i>Fregatidæ</i>	.	.	Frigate Bird	
"	<i>Phaëthontidæ</i>	.	.	Tropic Bird	<i>Pages 336-340</i>

ORDER: ODONTOGLOSSI (Flamingoes)

<i>Family</i>	<i>Phoenicopteridæ</i>	.	.	Flamingo	<i>Pages 340-341</i>
---------------	------------------------	---	---	----------	----------------------

ORDER: HERODIONES (Hérons and Storks)

<i>Family</i>	<i>Ardeidæ</i>	.	.	Hérons—Bitterns	
"	<i>Ciconiidæ</i>	.	.	Storks	
"	<i>Plataleidæ</i>	.	.	Ibises—Spoonbill	<i>Pages 341-346</i>

ORDER: ANSERES (Duck Tribe)

<i>Family</i>	<i>Anatidæ</i>	.	.	Geese—Swans—Ducks (Mallard, Sheld- duck, Shoveler, Teal, Wigeon, Pochard, Eider Duck, Scoters, Goosander, Merganser)	<i>Pages 346-352</i>
---------------	----------------	---	---	---	----------------------

ORDER: PALAMEDEÆ (Screamers)

<i>Family</i>	<i>Palamedeidæ</i>	.	.	Screamers	<i>Page 352</i>
---------------	--------------------	---	---	-----------	-----------------

ORDER : COLUMBÆ (Pigeons)

<i>Family</i>	Treronidæ . . .	Painted Pigeons—Fruit Pigeons	
„	Columbidæ . . .	True Pigeons	
„	Peristeridæ . . .	Turtle Doves	<i>Pages</i> 352-355

ORDER : GALLINÆ (Game-Birds, Fowls, etc.)

<i>Family</i>	Tetraonidæ . . .	Grouse—Ptarmigan	
„	Phasianidæ . . .	Partridges—Pheasants—Quails—Peafowl —Domestic Fowls	
„	Megapodiidæ . . .	Mound Builders	
„	Cracidæ . . .	Curassow—Guans	
„	Opisthocomidæ . . .	Hoatzin	<i>Pages</i> 355-364

ORDER : FULICARIÆ (Rail-like Birds)

<i>Family</i>	Rallidæ . . .	Rails—Moorhen—Coot	<i>Pages</i> 365-367
---------------	---------------	--------------------	----------------------

ORDER : ALECTORIDES (Bustards and Cranes)

<i>Family</i>	Otididæ . . .	Great Bustard	
„	Cariamidæ . . .	Cariama	
„	Psophiidæ . . .	Trumpeter	
„	Gruidæ . . .	Cranes	<i>Pages</i> 367-369

ORDER : LIMICOLÆ (Plover Tribe)

<i>Family</i>	Charadriidæ . . .	Plovers—Thick-knee—Oyster-Catcher	
„	Scolopacidæ . . .	Woodcock—Snipe—Curlew—Avocet —Ruff—Redshank—Greenshank	
„	Cursoriidæ . . .	Pratincole—Courser	<i>Pages</i> 370-376

ORDER : GAVIA (Gulls)

<i>Family</i>	Laridæ . . .	Gulls—Terns	
„	Stercorariidæ . . .	Skuas	<i>Pages</i> 376-379

ORDER : TUBINARES (Albatrosses and Petrels)

<i>Family</i>	Diomedeidæ . . .	Albatrosses	
„	Procellariidæ . . .	Petrels	<i>Pages</i> 379-381

ORDER : PYGOPODES (Diving Birds)

<i>Family</i>	Alcidæ . . .	Puffin—Auks—Razor-bill—Guillemot	
„	Podicipedidæ . . .	Grebes	
„	Colymbidæ . . .	Great Northern Diver	<i>Pages</i> 381-385

ORDER : IMPENNES (Penguins)

<i>Family</i>	Spheniscidæ . . .	Penguins	<i>Pages</i> 385-386
---------------	-------------------	----------	----------------------

SUB-CLASS : RATITÆ (Flightless Birds)

<i>Family</i>	Struthionidæ . . .	Ostrich	
„	Rheidæ . . .	Rhea	
„	Dromæidæ . . .	Emu	
„	Casuariidæ . . .	Cassowary	
„	Apterygidæ . . .	Kiwi	<i>Pages</i> 387-390

CLASS : REPTILIA (Reptiles)

ORDER : CROCODILIA (Crocodile Tribe)

<i>Family</i>	Crocodylidæ . . .	Crocodiles—Alligators	<i>Pages</i> 393-401
---------------	-------------------	-----------------------	----------------------

ORDER : CHELONIA (Tortoises and Turtles)

<i>Family</i>	Testudinidæ . . .	Land Tortoises—Pond Tortoises	
„	Chelydridæ . . .	Snapping Turtles	
„	Chelonidæ . . .	True Turtles	
„	Chelyidæ . . .	Side-necked Tortoises	<i>Pages</i> 401-407

CONTENTS

xi

ORDER : SQUAMATA

SUB-ORDER : LACERTILIA (Lizards)

<i>Family</i>	Geckonidæ . . .	Geckos	
„	Lacertidæ . . .	True Lizards	
„	Agamidæ . . .	Agamoid Lizards	
„	Iguanidæ . . .	Iguanoid Lizards	
„	Anguidæ . . .	Snake-like Lizards	
„	Helodermatidæ . . .	Poisonous Lizards	
„	Varanidæ . . .	Monitors	<i>Pages 407-414</i>

SUB-ORDER : RHIPTOGLOSSA (Chamæleons)

<i>Family</i>	Chamæleontidæ . . .	Chamæleons	<i>Pages 414-415</i>
---------------	---------------------	------------	----------------------

SUB-ORDER : OPHIDIA (Snakes)

<i>Family</i>	Colubridæ . . .	Colubrine Snakes (Ringed Snake, Cobra, Death Adder)	
„	Viperidæ . . .	Vipers (Puff Adder, Rattle-Snake, Anaconda, etc.)	
„	Boidæ . . .	Pythons—Boas	<i>Pages 416-428</i>

ORDER : RHYNCHOCEPHALIA (Beaked Lizards)

	Tuatera	<i>Page 428</i>
--	---------	-----------------

CLASS : AMPHIBIA (Amphibians)

ORDER : ANURA (Tailless Amphibians)

<i>Family</i>	Ranidæ . . .	Typical Frogs	
„	Hylidæ . . .	Tree Frogs	
„	Bufonidæ, etc. . . .	Toads	<i>Pages 431-436</i>

ORDER : URODELA (Tailed Amphibians)

<i>Family</i>	Salamandridæ . . .	Salamanders and Newts	
„	Sirenidæ . . .	Mud-eel	
„	Proteidæ . . .	Olm or Proteus	<i>Pages 436-438</i>

ORDER : APODA (Footless Amphibians)

<i>Family</i>	Cœciliidæ . . .	Cœcilia	<i>Page 438</i>
---------------	-----------------	---------	-----------------

CLASS : PISCES (Fishes)

SUB-CLASS : ELASMOBRANCHII

ORDER : SELACHII

SUB-ORDER : SQUALI (Dog-fishes and Sharks)

<i>Family</i>	Scylliidæ and Spinacidæ	Dog-fishes	
„	Carchariidæ . . .	Smooth Hound—Blue Shark—White Shark	
„	Cetorhinidæ . . .	Basking Shark	
„	Rhinodontidæ . . .	Whale Shark	
„	Sphyrnidæ . . .	Hammer-head Shark	
„	Lamnidæ . . .	Thresher Shark	<i>Pages 441-447</i>

SUB-ORDER : RAII (Rays and Saw-fishes)

<i>Family</i>	Raiidæ . . .	True Skates or Rays	
„	Torpedinidæ . . .	Electric Ray	
„	Myliobalidæ . . .	Devil Fish	
„	Trygonidæ . . .	Whip-tailed Sting Ray	
„	Pristidæ . . .	Saw-Fish	<i>Pages 441-448</i>

SUB-CLASS : DIPNOI		
<i>Family</i> Lepidosirenidæ, etc.	Lung-fishes	Page 448
SUB-CLASS : HOLOCEPHALI		
<i>Family</i> Chimæridæ . . .	Chimæroids	Page 449
SUB-CLASS : TELEOSTOMI		
ORDER : ASTYLOPTERYGII (Ganoid Fishes)		
<i>Family</i> Acipenseridæ . . .	Sturgeon—Sterlet	
„ Lepidosteidæ . . .	Gar-Pike	
„ Amiidæ . . .	Bow-Fin	Pages 449-450
ORDER : TELEOSTEI (Bony Fishes)		
SECTION : PHYSOSTOMI		
SUB-ORDER : ISOSPONDYLI (Salmon tribe)		
<i>Family</i> Salmonidæ . . .	Salmon — Trout — Grayling — Smelt — Oolachan	
„ Clupeidæ . . .	Herring—Sprat—Pilchard—Anchovy	
„ Elopidae . . .	Tarpon	
„ Osteoglossidæ . . .	Arapaima	Pages 450-454
SUB-ORDER : OSTARIOPHYSI		
<i>Family</i> Siluridæ . . .	Cat-fishes	
„ Gymnotidæ . . .	Electric Eel	
„ Cyprinidæ . . .	Carp — Barbel — Gudgeon — Bream — Tench—Roach—Chub—Dace—Bleak	Pages 455-458
SUB-ORDER : APODES		
<i>Family</i> Anguillidæ . . .	Common Eel—Conger Eel	Pages 458-460
SUB-ORDER : HAPLOMI		
<i>Family</i> Esocidæ . . .	Pike	
„ Cyprinodontidæ . . .	Four-eyed Fish	Pages 460-461
SECTION : PHYSOCLISTI		
SUB-ORDER : CATOSTEOMI		
<i>Family</i> Gastrosleidæ . . .	Sticklebacks	
„ Syngnathidæ . . .	Pipe Fish—Sea Horse	Pages 461-463
SUB-ORDER : PERCESOCES		
<i>Family</i> Mugilidæ . . .	Grey Mullet	
„ Anabantidæ . . .	Climbing Perch	
„ Scombresocidæ . . .	Gar-Fish—Flying Fish	Pages 463-464
SUB-ORDER : ANACANTHINI		
<i>Family</i> Gadidæ . . .	Cod—Haddock—Whiting—Pollack—Ling —Hake—Burbot	Pages 465-466
SUB-ORDER : ACANTHOPTERYGII (Spiny-finned Fishes)		
<i>Family</i> Percidæ . . .	Perch—Pope	
„ Sparidæ . . .	Snapper	
„ Pseudochromididæ . . .	Tile-fish	
„ Mullidæ . . .	Red Mullet	
„ Osphromenidæ . . .	Fighting Fish	
„ Chætodontidæ . . .	Chætodont	
„ Scombridæ . . .	Mackerel—Tunny—Bonito	
„ Xiphiidæ . . .	Sword-fish	
„ Carangidæ . . .	Pilot-fish	
„ Zeidæ . . .	John Dory	

<i>Family</i>	Pleuronectidæ . . .	Plaice—Flounder—Sole—Turbot— Halibut	
„	Gobiidæ . . .	Goby—Mud-Skipper	
„	Cottidæ . . .	Bull-Head	
„	Triglidæ . . .	Gurnard	
„	Scorpenidæ . . .	Red Fire-fish	
„	Echeneidæ . . .	Sucking-fish	
„	Blenniidæ . . .	Wolf-fish—Viviparous Blenny	
„	Trachinidæ . . .	Greater Weever	
„	Lophiidæ . . .	Angler-fish	
„	Diodontidæ . . .	Globe-fish	
„	Uranoscopidæ . . .	Star-gazer	<i>Pages</i> 466-479
	CLASS : CYCLOSTOMI (Lampreys)		<i>Page</i> 480

INVERTEBRATA (Invertebrate Animals)

SUB-KINGDOM : MOLLUSCA (Soft-bodied Animals)

CLASS : CEPHALOPODA (Head-footed Molluscs)

ORDER : DIBRANCHIA. SUB-ORDERS OCTOPODA AND DECAPODA

<i>Family</i>	Octopodidæ . . .	Octopus	
„	Argonautidæ . . .	Argonaut	
„	Loliginidæ . . .	Squid	
„	Sepiidæ . . .	Cuttle-fish	<i>Pages</i> 483-486
	CLASS : GASTROPODA (Stomach-footed Molluscs)		

ORDER : PECTINIBRANCHIA

<i>Family</i>	Buccinidæ . . .	Whelk	
„	Littorinidæ . . .	Periwinkle	
„	Strombidæ . . .	Scorpion-shell	
„	Cypræidæ . . .	Cowry	<i>Page</i> 487

ORDER : SCUTIBRANCHIA

<i>Family</i>	Patellidæ . . .	Limpet	
---------------	-----------------	--------	--

ORDER : PULMONATA

<i>Family</i>	Helicidæ . . .	Common Snail—Edible Snail	
„	Stenogyridæ . . .	Giant Snail	
„	Limnæidæ . . .	Pond Snail	<i>Pages</i> 487-489

CLASS : PELECYPODA (Bivalves)

ORDER : FILIBRANCHIA

<i>Family</i>	Mytilidæ . . .	Mussel	
„	Pteriidæ . . .	Pearl Oyster	
„	Pectinidæ . . .	Scallop	<i>Page</i> 490

ORDER : EULAMELLIBRANCHIA

<i>Family</i>	Ostreidæ . . .	Oyster	
„	Tridacnidæ . . .	Clam	
„	Teredinidæ . . .	Teredo, or Ship-worm	<i>Pages</i> 490-491

SUB-KINGDOM : ARTHROPODA

CLASS : INSECTA (Insects)

ORDER : ORTHOPTERA (Straight-winged Insects)

<i>Family</i>	Forficulidæ . . .	Earwig	
„	Blattidæ . . .	Cockroach	
„	Mantidæ . . .	Praying Mantis	
„	Phasmidæ . . .	Leaf and Stick-Insects	
„	Gryllidæ . . .	Crickets	
„	Locustidæ . . .	Grasshopper—Locust	<i>Pages</i> 492-497

ORDER : NEUROPTERA (Nerve-winged Insects)

<i>Family</i>	Libellulidæ . . .	Dragon-fly	
"	Ephemeridæ . . .	May-fly	
"	Chrysopidæ . . .	Lace-wing Fly	
"	Myrmeleonidæ . . .	Ant-Lion	
"	Termitidæ . . .	White Ants	<i>Pages 497-507</i>

ORDER : LEPIDOPTERA (Butterflies and Moths)

SECTION : RHOPALOCERA (Butterflies)

<i>Family</i>	Pieridæ . . .	Large Garden—Orange Tip—Clouded Yellow—Brimstone	
"	Papilionidæ . . .	Swallow-tailed Butterfly	
"	Nymphalidæ . . .	Peacock—Red Admiral—Painted Lady—Camberwell Beauty—Tortoise-shell—Queen of Spain Fritillary	<i>Pages 500-502</i>

SECTION : HETEROCERA (Moths)

<i>Family</i>	Sphingidæ . . .	Death's Head Hawk-Moth—Eyed Hawk-Moth	
"	Ægeriidæ . . .	Clearwings	
"	Cossidæ . . .	Goat Moth	
"	Arctiidæ . . .	Tiger-moths	
"	Notodontidæ . . .	Puss Moth	
"	Geometridæ . . .	Swallow-tailed Moth	
"	Saturniidæ . . .	Emperor Moth—Great Atlas Moth—Cecropian Silk-moth	
"	Bombycidæ . . .	Common Silk-moth	<i>Pages 502-507</i>

ORDER : HYMENOPTERA (Membrane-winged Insects)

<i>Family</i>	Tenthredinidæ . . .	Saw-fly	
"	Cynipidæ . . .	Gall-fly	
"	Ichneumonidæ . . .	Ichneumon-fly	
"	Formicidæ . . .	Social Ants	
"	Crabronidæ & Philanthidæ	Burrowing Wasps	
"	Vespidæ . . .	Paper Wasps—Hornets	
"	Apidæ . . .	Honey-Bees	
"	Andrenidæ . . .	Solitary Bees	<i>Pages 507-512</i>

ORDER : DIPTERA (Two-winged Flies)

<i>Family</i>	Muscidæ . . .	House-fly—Bluebottle	
"	Tipulidæ . . .	Crane-fly	
"	Culicidæ . . .	Gnats	
"	Syrphidæ . . .	Drone-fly	
"	Tabanidæ . . .	Breeze-fly	
"	Œstridæ . . .	Gad-flies	
"	Pulicidæ . . .	Common Flea	
"	Sarcopsyllidæ . . .	Burrowing Flea	<i>Pages 512-516</i>

ORDER : COLEOPTERA (Beetles)

SECTION : PENTAMERA

<i>Family</i>	Cicindelidæ . . .	Tiger-Beetles	
"	Carabidæ . . .	Bombardier Beetle	
"	Dytiscidæ . . .	Water Beetle	
"	Gyrinidæ . . .	Whirligig Beetle	
"	Hydrophilidæ . . .	Great Black Water Beetle	
"	Staphylinidæ . . .	Rove Beetles	
"	Silphidæ . . .	Burying Beetles	

<i>Family</i>	Lucanidæ . . .	Stag Beetle	
„	Scarabæidæ . . .	Cockchafer—Hercules Beetle—Goliath Beetle	
„	Lampyridæ . . .	Glow-worm—Fire-fly	
„	Ptinidæ . . .	Death-Watch	<i>Pages</i> 516-520

SECTION : HETEROMERA

<i>Family</i>	Meloidæ . . .	Oil Beetles	
---------------	---------------	-------------	--

SECTION : TETRAMERA

<i>Family</i>	Curculionidæ . . .	Weevils	
„	Chrysomelidæ . . .	Colorado Potato-Beetle	<i>Page</i> 520

SECTION : PSEUDOTRIMERA

<i>Family</i>	Coccinellidæ . . .	Lady-birds	<i>Pages</i> 520-521
---------------	--------------------	------------	----------------------

ORDER : RHYNCHOTA

<i>Family</i>	Aphidæ . . .	Plant-Lice—Phylloxera	
„	Coccidæ . . .	Cochineal Insect—Lac Insect	
„	Cicadidæ . . .	Cicadas	<i>Pages</i> 521-522

CLASS : CRUSTACEA

SUB-CLASS : MALACOSTRACA

ORDER : DECAPODA (Ten-legged Crustaceans)

SUB-ORDER : BRACHYURA (Short-tailed Crustaceans)

<i>Family</i>	Cancridæ . . .	Edible British Crab	
„	Portunidæ . . .	Swimming Crab—Shore Crab	
„	Thelphusidæ . . .	River Crab	
„	Geocarcinidæ . . .	Land Crabs	
„	Maiidæ . . .	Spider Crabs—Giant Japanese Crab	
„	Ocypodidæ . . .	Swift-footed Crabs—Calling Crabs	

SUB-ORDER : ANOMURA

<i>Family</i>	Paguridæ . . .	Hermit-Crab	
„	Lithodidæ . . .	Stone-Crab	
„	Cænobitidæ . . .	Cocoanut Crab	

SUB-ORDER : MACRURA (Long-tailed Crustaceans)

<i>Family</i>	Homaridæ . . .	Lobster	
„	Astacidæ . . .	Crayfish	
„	Crangonidæ . . .	Shrimp	
„	Palæmonidæ . . .	Prawn	<i>Pages</i> 522-526

ORDER : AMPHIPODA

SUB-ORDER : GAMMARIDEA—Sand-hopper

ORDER : ISOPODA

SUB-ORDER : ONISCOIDEA—Woodlice

SUB-CLASS : CIRRIPIEDIA

ORDER :	THORACICA—Barnacles	<i>Pages</i> 526-528
---------	---------------------	----------------------

CLASS : ARACHNIDA (Spiders and Scorpions)

ORDER : ARANEÆ (Web-Spiders)

<i>Family</i>	Agelenidæ . . .	House-Spider—Water Spider	
„	Argiopidæ . . .	Garden Spider	
„	Lycosidæ . . .	Wolf-Spider—Tarantula	
„	Aviculariidæ . . .	Bird-eating Spiders	
„	Ctenizidæ . . .	Trap-door Spiders	<i>Pages</i> 528-531

ORDER : SCORPIONES (Scorpions)

<i>Family</i> Buthidæ	Spanish Scorpion—Rock Scorpion	<i>Pages</i> 531-532
-------------------------------	--------------------------------	----------------------

ORDER : ACARI (Mites and Ticks)

<i>Family</i> Trombidiidæ	Harvest-bug	
„ Tetranychidæ	Spinning-mites	
„ Sarcoptidæ	Cheese-mite—Itch-mite	
„ Ixodidæ	Ticks	<i>Pages</i> 532-533

CLASS : CHILOPODA (Centipedes)

ORDER : SCOLOPENDROMORPHA

<i>Family</i> Scolopendridæ	Giant Centipede	
„ Cryptopidæ	Common English Centipede	<i>Page</i> 534

ORDER : GEOPHILOMORPHA

<i>Family</i> Geophilidæ	Phosphorescent Geophilid	<i>Page</i> 534
----------------------------------	--------------------------	-----------------

ORDER : LITHOBIOMORPHA

<i>Family</i> Lithobiidæ	Small British Centipedes	<i>Pages</i> 534-535
----------------------------------	--------------------------	----------------------

CLASS : DIPLOPODA (Millipedes)

ORDER : ONISCOMORPHA

<i>Family</i> Glomeridæ	Pill Millipedes	
„ Iulidæ	Common Millipedes	<i>Pages</i> 535-536

SUB-KINGDOM : VERMES (Worm-like Invertebrates)

<i>Class</i> Annelida	Worms	
„ Hirudinea	Leeches	<i>Pages</i> 536-538

SUB-KINGDOM : ECHINODERMATA (Hedgehog-skinned Invertebrates)

<i>Class</i> Echinoidea	Sea-Urchins	
„ Asteroidea	Star-fish	
„ Holothuroidea	Sea-Cucumbers	<i>Pages</i> 538-540

SUB-KINGDOM : CŒLEENTERATA

<i>Class</i> Polypomedusæ	Jelly-fish	
„ Anthozoa	Sea-Anemones—Corals	<i>Pages</i> 540-544
<i>Sub-kingdom</i> Porifera	Sponges	<i>Pages</i> 544-547
<i>Sub-kingdom</i> Protozoa	Simplest Animals	<i>Pages</i> 547-548

COLOURED PLATES

I.	Tiger	<i>Frontispiece</i>
II.	Silvery Gibbon—Chimpanzee	<i>Facing page 8</i>
III.	Pig-tailed Macaque—Diana Monkey—Mandrill	26
IV.	Leopard—Lion	56
V.	Striped Hyæna—Black-backed Jackal—Wolf	80
VI.	Polar Bear—Grizzly Bear	104
VII.	Beaver—Porcupine	134
VIII.	African Rhinoceros—Indian Elephant	144
IX.	American Tapir—Mountain Zebra	152
X.	Urinal—Barbary Sheep	164
XI.	Springbok—Eland	176
XII.	Wapiti Deer—Axis Deer	192
XIII.	Hippopotamus—Bactrian Camel	214
XIV.	Kangaroo—Sloth	224
XV.	Sedge Warbler—Whinchat—Redbreast—Goldfinch — Lesser Whitethroat — Blue Tit — Song Thrush—Dipper	256
XVI.	Great Spotted Woodpecker—Nightjar—Bee-eater —Kingfisher—Cuckoo	304
XVII.	Osprey—Golden Eagle—Kestrel—Honey Buzzard	328
XVIII.	Capercaillie — Snipe — Woodcock — Amherst's Pheasant	358
XIX.	Common Gull—Stormy Petrel—Avocet—Red- shank—Great Northern Diver	376
XX.	Pond Tortoise — Green Turtle — Mississippi Alligator	400
XXI.	Heloderm — Diamond Rattle-Snake — Royal Python	416
XXII.	Perch—Trout—Salmon	450
XXIII.	Flying Fish—Red Fire-fish	464
XXIV.	Peacock Butterfly—Red Admiral Butterfly— —Marbled White Butterfly — Cream-Spot Tiger Moth—Swallow-tailed Butterfly—Eyed Hawk-Moth—Puss Moth	502

ILLUSTRATIONS IN THE TEXT

NO.	PAGE	NO.	PAGE
1. Young Gorilla . . .	9	46. Indian Wild Dog . . .	83
2. Young Orang-Utans . . .	12	47. Dingo and Young . . .	84
3. Siamang . . .	14	48. Cape Hunting Dog . . .	85
4. White-thighed Guereza . . .	17	49. Common Fox . . .	87
5. Green Monkey . . .	18	50. Arctic Fox . . .	88
6. Vervet Monkey . . .	19	51. Fennec . . .	89
7. Rolloway Monkey . . .	20	52. Pine Marten . . .	90
8. Patas Monkey . . .	21	53. Polecat . . .	91
9. Hamlyn's Mangabey . . .	22	54. Ferret . . .	93
10. Wanderoo . . .	24	55. Canadian Skunk . . .	95
11. Barbary Ape . . .	25	56. Common Badger . . .	97
12. Chacma . . .	27	57. European Otter . . .	98
13. Variegated Spider Monkey . . .	30	58. Raccoon . . .	100
14. Capuchin Monkey . . .	31	59. Coaiti . . .	101
15. White-headed Saki . . .	32	60. Kinkajou . . .	102
16. Black-eared Marmoset . . .	34	61. Brown Bear . . .	103
17. Ruffed Lemurs . . .	36	62. Malayan Bear . . .	105
18. Maholi Galago . . .	37	63. Sloth Bear . . .	106
19. Slender Loris . . .	38	64. Common Seals . . .	110
20. Aye-Aye . . .	39	65. Sea Lion . . .	114
21. Long-eared Bat . . .	41	66. Young Walrus . . .	117
22. Greater Horseshoe Bat . . .	43	67. English Squirrel . . .	119
23. Australian Fruit Bat . . .	45	68. Grey Squirrel . . .	120
24. Hedgehog . . .	47	69. Prairie Marmot . . .	123
25. Mole . . .	50	70. Jerboa . . .	125
26. Common Shrew . . .	51	71. Black Rat . . .	128
27. Tenrec . . .	53	72. Field Vole . . .	129
28. Lion Cub . . .	57	73. Musquash . . .	131
29. Sumatran Tiger . . .	61	74. Hamster . . .	132
30. Jaguar . . .	64	75. Dormice . . .	133
31. Puma . . .	66	76. Brazilian Tree Porcupine . . .	135
32. Ocelot . . .	67	77. Agouti . . .	136
33. Serval . . .	67	78. Capybara . . .	138
34. Wild Cat . . .	68	79. Chinchilla . . .	139
35. European Lynx . . .	69	80. Viscacha . . .	139
36. Caracal . . .	70	81. Hare . . .	140
37. Cheetah . . .	71	82. Dutch Rabbit . . .	142
38. Common Civet . . .	72	83. Hyrax . . .	143
39. Genet . . .	73	84. Indian Elephant . . .	146
40. Indian Mongoose . . .	74	85. African Elephant . . .	148
41. Aard Wolf . . .	75	86. Malayan Tapir . . .	149
42. Spotted Hyæna . . .	77	87. Rhinoceros . . .	150
43. Young Wolves and Foster-mother . . .	79	88. Mongolian Wild Horse . . .	153
44. Prairie Wolf . . .	81	89. Wild Ass and Foal . . .	155
45. Indian Jackal . . .	82	90. Burchell's Zebra . . .	156
		91. Zebu . . .	158

ILLUSTRATIONS IN THE TEXT

xix

NO.	PAGE	NO.	PAGE
92. Yak	160	149. Bullfinch	271
93. American Bison	161	150. Cirl Bunting	273
94. Dwarf Buffalo	162	151. Long-tailed Tit	275
95. Merino Sheep.	165	152. Wren	277
96. Mouflon	166	153. Skylark.	278
97. Tur	169	154. Yellow Wagtail	280
98. Markhor	170	155. Tree Pipit	281
99. Takin	172	156. Swallow	282
100. Chamois	174	157. Ravens	286
101. Beatrix Antelope	176	158. Hooded Crow	287
102. Sable Antelope	177	159. Jackdaw	289
103. Dorcas Gazelle	178	160. Jay	291
104. Sing-Sing Waterbuck	180	161. Tree-Creeper	293
105. Brindled Gnu	182	162. Pied Flycatcher	294
106. Dik-Dik Antelope	184	163. Great Grey Shrike	295
107. Giraffe	186	164. Waxwing	296
108. Giraffe in drinking attitude	187	165. Nests of Weaver Finches	298
109. Okapi	188	166. Greater Bird of Paradise	299
110. Red Deer	191	167. Lyre Bird	301
111. Sambar Deer	195	168. Cock of the Rock	303
112. Albino Muntjac	197	169. Ariel Toucan	305
113. Reindeer	198	170. Wryneck	307
114. Musk Deer	202	171. Hoopoe	308
115. Indian Chevrotain	203	172. Concave Hornbill	310
116. Young Dromedary	204	173. Humming-Bird	312
117. Llama	206	174. Grey Parrot	314
118. European Wild Pig	208	175. Greater Sulphur-crested Cockatoo	316
119. Wart Hog	210	176. Red and Blue Macaw	317
120. Babirusa	211	177. Barn Owl	319
121. Collared Peccary	212	178. Snowy Owl	321
122. Young Hippopotamus	213	179. Peregrine Falcon	323
123. Dugong	216	180. Common Kite	326
124. Common Rorqual	219	181. Sparrow Hawk	327
125. Porpoise	223	182. White-tailed Sea-Eagle	329
126. Great Ant-Eater	225	183. Monkey-eating Eagle	331
127. Broad-banded Armadillo.	227	184. Lammergeier	333
128. Aard-vark	228	185. Secretary-Bird	334
129. Tree Kangaroos	230	186. Condor	336
130. Red-necked Wallaby	232	187. Gannet	338
131. Spotted Cuscus	233	188. Pelican	339
132. Ring-tailed Phalanger	234	189. Flamingoes	340
133. Sugar Squirrel	235	190. White Heron	342
134. Wombat	237	191. Little Bittern	343
135. Rabbit-eared Bandicoot	237	192. Marabou Stork	344
136. Tasmanian Devil	239	193. Spoonbill	345
137. Thylacine	240	194. Egyptian Goose	347
138. Duckbill	242	195. Mute Swans	348
139. Echidna	243	196. Variegated Sheld-ducks	350
140. Condor's Wing	250	197. Blue-tailed Fruit Pigeons	353
141. Blackbird	255	198. Young Turtle Doves	354
142. Redstart	257	199. Willow Grouse	356
143. Nightingale	259	200. Partridge	357
144. Blackcap	262	201. Common Pheasant	358
145. Wood Warbler	265	202. Peacock	360
146. Greenfinch	267	203. American Wild Turkey	362
147. Chaffinch	268	204. Crested Curassow	364
148. Linnet	269	205. Australian Rail	366

NO.	PAGE	NO.	PAGE
206. Coot	367	248. Cat-fish	455
207. Great Bustard	368	249. Roach	457
208. Common Crane	369	250. Conger Eel	459
209. Ringed Plover	371	251. Pike	460
210. Black Oyster-Catcher	372	252. Three-spined Stickleback	462
211. Curlew	374	253. Cod	465
212. Greater Black-backed Gull	377	254. Pope, or Ruffe	467
213. Common Tern	378	255. Mackerel	470
214. Great Skua	379	256. Sword-fish	471
215. Puffin	382	257. John Dory	472
216. Little Grebe	384	258. Mud-Skipper	474
217. Penguins	386	259. Sucking-fish	476
218. Somali Ostrich	388	260. Lesser Spotted Globe-Fish	478
219. Kiwi	389	261. Squid, or Cuttle-fish	486
220. Eggs of Python, Hen, and Crocodile	394	262. Scorpion-Shell	488
221. Broad-fronted Crocodile	397	263. Giant Snail	489
222. Rough-eyed Caiman	399	264. Great Clam-shell	491
223. Elephantine Tortoise	403	265. Leaf Insect	494
224. Snapping Turtle	404	266. Stick-insects	495
225. Matamata Tortoise	406	267. Migratory Locust	496
226. Sand Lizard	409	268. Termites' Nest	499
227. Moloch Lizard	410	269. Great Atlas Moth	504
228. Iguana	412	270. Cecropian Silk-moth	505
229. Chamæleon	415	271. Red Ants	509
230. Skull of Indian Python	417	272. Wasp	510
231. Ringed Snakes emerging from eggs	419	273. Hornet	510
232. Black and White Cobra	421	274. Humble-Bee	511
233. British Viper	422	275. Leaf-cutting Bee	512
234. Puff Adder	423	276. Stag Beetle	518
235. Common Boa	427	277. Hercules Beetle	519
236. Edible Frog	432	278. River Crab	523
237. Natterjack Toad	434	279. Stone-Crab	525
238. Giant Toad	435	280. Prawns	527
239. Spotted Salamander	436	281. Bird-eating Spider	530
240. Crested Newt	437	282. Trap-door Spider's Nest	531
241. Fins of a Fish	441	283. Spanish Scorpion	532
242. Saw-fish	443	284. Red-legged Millipedes	535
243. Basking Shark	446	285. Sea-Urchin	538
244. Whip-tailed Sting Ray	448	286. Star-fish	539
245. Sturgeon	449	287. Sea-Cucumber	540
246. Rainbow Trout	452	288. Beadlet Anemone	542
247. Herring	453	289. Stag's-horn Coral	544
		290. Lyssacine Sponge	545
		291. Euplectellid Sponge	546

NEW ILLUSTRATED NATURAL HISTORY OF THE WORLD

INTRODUCTION

IN order to understand any science rightly, it demands that the student should proceed in an orderly manner ; and in no case is this more important than in a contemplation of all living creation with its myriad forms of life as it exists to-day. As a general arranges his army into its greater divisions, and each division into regiments and companies, so does the naturalist separate the host of living creatures, from the elephant down to those of microscopic proportions, into greater and smaller groups. The animal world easily falls into two great divisions, the Vertebrata and the Invertebrata ; and these are again divided into classes, orders, families, and species.

THE VERTEBRATES

The term vertebrate is derived from the Latin word *vertĕre*, signifying 'to turn,' and in this division are included all those creatures which possess a brain and spinal cord, the former enclosed in a cranium or skull, and the latter within the vertebral column, which consists of a succession of bony segments, moving upon each other, in order that the animal may flex its body. These segments, the vertebræ, in the various species of animals vary in number and the manner in which they are affixed to and work upon each other, according to the amount of flexibility required by the animal of which they form a part. A man has twenty-six separate bones in his vertebral column, while a snake has quite fifteen times as many. If the elephant and the snake could exchange spines, the former, with its ponderous weight, would collapse almost like jelly ; and the latter would become nearly as rigid as a stick, instead of being the acme of sinuous and contortionate movement.

Among the Vertebrates are to be found creatures as dissimilar in external form as the chimpanzee, ostrich, crocodile, eel, and frog, yet all agreeing in the possession of a spinal cord protected by vertebræ. The position of the spinal cord, in every case, is along

the back ; and it is really the situation of the chief nervous cord that decides the division to which any living creature is to be referred.

The Vertebrate animals are divided into five classes :

I. MAMMALIA (Latin, *mamma*, a teat). Animals possessed of vertebræ ; breathing atmospheric air by lungs ; heart with two auricles and two ventricles ; blood, warm and red ; producing living young ; nurturing them by milk ; skin covered with hair, spines, or scales.

II. AVES (Latin, *avis*, a bird). Vertebrated, feathered animals breathing atmospheric air by lungs ; having warm blood and heart with four chambers ; the young, hatched from eggs, are not suckled ; mouth modified into a horny beak without true teeth ; fore-limbs developed into wings, mostly used for flight ; hind limbs always used for standing, or progression on earth or in water.

III. REPTILIA (Latin, *repto*, to creep). Animals with distinct bony skeleton ; skin clothed with horny plates or scales, covered with thin epidermis, often shed periodically ; respiration by lungs ; heart with three chambers ; young produced from eggs, sometimes hatched before birth ; the young resemble the parent, and undergo no transformation.

IV. AMPHIBIA or BATRACHIA (Greek, *amphibios*, having a double life ; Greek *batrachos*, a frog). Animals, more or less fish-like in the early period of their existence, breathing only by gills, and having a two-chambered heart ; finally acquiring lungs and a heart of three chambers ; produced from eggs, which are enclosed in a soft, glutinous membrane, laid in the water and usually hatched by the heat of the sun.

V. PISCES (Latin, *piscis*, a fish). Vertebrated animals, respiring through gills ; living in water ; heart with one auricle and one ventricle ; blood, cold and red.

THE INVERTEBRATA

In the Invertebrata are comprised all those creatures which are destitute of a cranium and vertebral column. The vertebrated animals include over twenty-four thousand species, and constantly new ones are becoming known to science ; but, known and unknown, they form only a small company in the great army of life. To present anything like a complete census of the Invertebrates is impossible, and in earth and sea there remain myriads of beings yet unseen by mortal eyes.

There are such marked divergences in structure between the various kinds of Invertebrates that for the present they may better be distinguished from the Vertebrates by negative characters. No

Invertebrate respire by means of its mouth, nor has it a nervous system running along its back. No Vertebrate animal has more than four true limbs, but most Invertebrates possess at least six, generally more, and in a few cases exceed a hundred; many of the insects are also fitted with wings.

Naturalists differ greatly in their views concerning the classification of creatures that exhibit such variety in structure and appearance as insects, spiders, crabs, starfish, oysters, worms, jelly-fish, sponges, coral, etc.; but considerations of space, no less than lucidity, suggest that the descriptions of these lower forms of animal life be left until they appear in the chapters specially devoted to them.

THE MAMMALIA

The Mammals comprise Man and some two thousand seven hundred species, among which are those whose structure is the most perfect, movements most varied, and intelligence the most highly developed. All the animals of this class are furnished with organs called the mammary glands, secreting the milk by which their young are nourished. The mammæ differ in number and position in various animals. Those creatures that produce only one or two young at the same birth, such as the monkey, elephant and others, have only two mammæ; while others, such as the cat and swine, are furnished with a sufficient number of these organs to accommodate their more numerous progeny. Sometimes the mammæ are placed on the breast, as in the monkey tribe; sometimes by the hind legs, as in the cow and horse; and sometimes along the abdomen, as in the swine and others.

Though Man himself is without the scope of this present work, some brief references must be made to the human body for the sake of comparison with those animals of less exalted plan and model.

In the human body there are more than two hundred distinct and separate bones, which are so modified and disposed as to secure a vertical position, an attitude that at once distinguishes Man from the brute creation. The strength and balance of the human frame is particularly exemplified in the Eastern porters, who commonly carry burdens of eight hundredweights upon their shoulders, while a strong man at rest can support a weight of two thousand pounds. Between China and Tibet human pack animals carry loads of from two to four hundred pounds of tea over mountain passes 7000 feet high, which is twice the load of a transport mule engaged in the same trade.

In some physical aspects Man is inferior to the beasts; he is destitute of fighting teeth or claws; possesses only a thin skin that is not protected by fur, bristles or scales; and is surpassed in speed by many of his antagonists. He is not favoured with the delicate

hearing of the herbivorous quadrupeds, the piercing sight of the eagle, or the keen scent of the beast of prey; and he is little able to endure hunger or loss of sleep. But his surpassing reason enables Man to rise superior to any physical shortcomings, and his intellect prevents him being governed by his fears; it suggests, and his clever fingers construct, weapons more destructive than the claws and teeth of the lion. Man provides himself with clothing and stout dwellings for warmth and defence; and he subdues all other animals, using them for food, to labour for him, and in many other ways minister to his necessities.

The vertebræ vary in number in different animals, but it is practically a law among Mammals that seven vertebræ should form the neck, there being only three constant exceptions. The pig and the giraffe, for example, have the same number of bones in their respective necks; and thus it is that the neck of the giraffe possesses so little flexibility, that it can pick up a leaf from the ground only with considerable difficulty.

The teeth of human beings are so arranged that the surfaces of those in the upper and lower jaws correspond, and the crown of each tooth is capped with enamel, the hardest substance in the body. The teeth are divided into *incisors*, or cutting teeth, such as are used in biting a piece out of an apple; *canines*, or dog teeth, which are serviceable for tearing off a piece of any specially hard substance; and *molars* (Latin, *mola*, a mill), or back double-teeth, which are used for grinding. The number and position of the teeth in an adult male may be set down thus:

$$I. \frac{2}{2}, C. \frac{1}{1}, P.M. \frac{2}{2}, M. \frac{3}{3} = 32$$

On the side of each jaw, above and below, are 2 incisors, 1 canine, 2 pre-molars, and 3 molars; 16 teeth on each side of the mouth, or 32 in all.

The teeth of the Mammals vary considerably, not only in number, but in type and arrangement. The teeth of a monkey are the same in number, but less regular than those of a man. Some animals are practically toothless, while others possess over fifty. The carnivorous animals have the canines very highly developed for the purpose of tearing the flesh of living prey; the gnawing animals possess no canines, but have the incisors, two in each jaw, developed to the fullest extent; the insect-eaters have their grinders dotted with conical points, with which to crush the hard coverings of some of the insects upon which they feed; and in the case of the cud-chewers, the upper incisors are replaced by a hard pad. Thus it is that the Mammals are largely classified according to the differences in their dentition, for the teeth usually indicate a creature's habit of life, and especially the kind of food upon which it principally lives.

The feet are also of great importance in assisting the classification

of the Mammalia, e.g., *biped* (two-footed), of which the only example is Man, who is also two-handed; *quadruped* (four-footed), applicable to all of the Mammals, except certain marine animals, and the monkeys which form the *quadrumania* (four-handed animals). The sole-walkers are the *plantigrades*, as the bear and badger; and the toe-walkers are the *digitigrades*, as the cat and dog. According to the construction of the foot, we are able to divide animals into climbers, burrowers, jumpers, and swimmers. Animals which can be used for draught purposes exhibit various forms of feet, e.g. the horse, solid-hoofed for rapid progress while bearing a load; and the camel, with cushioned feet, specially adapted for progression on desert sands.

According to the present system of classification the Mammalia are divided into the following orders, distinguished from each other by the character of their teeth, limbs, etc. :—

1. Primates : Man, apes, monkeys, and lemurs.
2. Chiroptera : Bats.
3. Insectivora : Insect-eaters.
4. Carnivora : Cats, dogs, weasels, bears, seals, etc.
5. Rodentia : Gnawing animals.
6. Ungulata : Hoofed animals.
7. Sirenia : Manatees and dugongs.
8. Cetacea : Whales and dolphins.
9. Edentata : Toothless animals.
10. Marsupialia : Pouched animals.
11. Monotremata : Duckbill and Echidna.

With this brief introduction we proceed to turn over the pages of the book of Nature, avoiding technical phraseology, irksome to read and impossible to remember without great effort. The pageant of animal life is too full of interest for mere facts, dead, hard and dry, to do it justice. We must search out the animals in their native haunts, ascertain their life histories, and if the pen fail to impart picturesqueness, the illustrations, taken in every case from life, will be accounted as some atonement.

CLASS : MAMMALIA

ORDER : PRIMATES

APES, MONKEYS AND LEMURS

OF all living creatures the members of the great Monkey tribe appeal to our interest, if only because apparently they resemble man. Any similarity, however, is only relative, for even the most man-like apes present but a rather remote and grotesque air of humanity ; the habits of the majority are by no means pleasing ; and in the case of the baboons particularly, both aspect and manners are calculated to fill us with disgust.

In some purely anatomical respects the greater apes bear more than a slight resemblance to mankind, and in none more than the capability of assuming a partially erect position. An erect attitude, however, is not the normal posture of even the most accomplished apes, which can progress on their bent hind legs only with difficulty, and really with less ease than is attained by a highly trained dog. Only in one case can a monkey comfortably walk squarely upon the soles of the feet ; and especially with the bigger animals the gait is only a strained and vacillating wobble, while balancing themselves with their arms.

If the hinder extremities of the monkey tribe are not to be compared to the human foot, the fore-limbs cannot by any stretch of imagination be viewed as possessing true hands. The fore-paws of some monkeys are altogether devoid of an effective thumb, in which case only the hind feet approach the human hand in its capacity for grasping. The most highly developed hand possessed by any monkey, even when its thumb has the greatest freedom of opposable motion, is only a caricature of the human hand—it lacks completely any intellectual power. The monkey's hand is a slinking, crafty, thieving paw, and not a true hand, just as the hind extremities are merely paws formed for grasping instead of walking.

The progression of animals is effected by various means ; some patter along upon their paws, others gallop or trot upon hoofs, while some aquatic animals propel themselves by means of paddles. Man is the only being that possesses true hands and feet—man alone can walk.

Almost a cursory examination of the skeletons of a man and an ape show marked differences in structure, even where the resem-

blance is greatest ; and the contrasted shapes speak eloquently of the almost immeasurable distance that separates the two beings. There is a refinement in the build of a man altogether lacking in the massive bones of the beast. Size for size the legs of the ape are shorter, while the fore-limbs are correspondingly longer, but the greatest difference lies in the position of the orifice of the skull through which the spinal cord enters the brain. In the human being this opening is so placed that the head is beautifully poised to allow an easily erect position. In the ape the orifice is set further back, and the skull is thrown forwards so as to overbalance the body ; added to which the knees are always partially bent, so that we may declare not unfairly that a monkey is only a quadruped, with paws more fully developed than is the case with the generality of animals.

The Monkey tribe is divided into two sections—the Anthro-poidea, in which are the animals that most resemble man, and the Lemuroidea, which contains a race of monkey-like animals, linking the higher anthropoids to the true quadrupeds. Really, the term ‘ monkey ’ belongs only to one group of the Anthro-poidea, but popularly, it is understood to include not only apes and baboons, but also the marmosets and lemurs, in which some of the fingers and toes are fitted with claws instead of flat nails.

THE ANTHROPOIDEA

FAMILY: SIMIIDÆ

THE GORILLA (*Gorilla savagei*)

The Gorilla, the largest and strongest of all the Anthropoid apes, is found only in a very restricted region between the Niger and the Congo in Western Africa ; when full grown the animal attains a height of from five to six feet. The body and hind legs are comparatively small, but there is a great breadth of shoulder with long fore-arms, and the whole structure of the animal is brutally suggestive of immense strength. The huge, muscular hind paw has an enormous thumb, and a human hand placed in that of a Gorilla is quite lost in the short, thick, partially webbed fingers, the middle one of which may exceed five inches in circumference. The skin of the animal is black, and its hairy coat but a shade lighter, chiefly owing to an admixture of variously coloured hairs among the black ones which predominate ; the hair on the top of the head and on the cheeks is greyish brown in colour, but with advancing years the animal becomes distinctly grizzled.

The bullet head, deep-sunken between the shoulders, and face of the Gorilla instantly rivet attention, for in the whole animal creation there is to be found, perhaps, nothing quite so frankly brutal in character. If the general outline suggest an affinity with

mankind the face quickly dispels the thought. The cavernous mouth, with its comparatively thin lips, is fitted with irregular, powerful teeth, of which the canines are developed into tusks projecting more than an inch from the jaw. Running over the top of the skull are various bony ridges to which are attached the muscles necessary for working the powerful jaws. The overhanging frontal ridge imparts to the features a fixedly scowling expression, accentuated by the dark brown eyes wherein glows a baleful, almost emerald light, which, under the influence of anger, adds the last touch to complete the malignancy of the features.

The Gorilla is comparatively new to zoologists, for Europeans knew practically nothing reliable concerning it until 1847, when Professor Owen received a skull from an American missionary on the Gaboon River. Fourteen years later Du Chaillu added to our information, but it was not until 1875 that a known living animal was brought to Europe, although as early as 1860 a travelling showman in England possessed one of these animals, which he quite wrongly supposed to be a chimpanzee, and the mistake was not discovered until the creature's death. Only immature specimens are ever seen in zoological collections, and though at Breslau one lived for seven years, lung disease usually carries them off under two years. The animal figured in the photograph was the sixth or seventh that had been seen at the Zoological Gardens, Regent's Park; some of them lived six months, but this one only a few weeks.

The Gorilla is mainly a vegetarian, but in addition to tender shoots, nuts, bananas, and various plum-like fruits, it does not disdain birds' eggs and insects. Some travellers assert that the animal is habitually a flesh-eater, but it is equally certain that it does not deliberately hunt and kill other animals for food, although it might readily make a meal upon any dead animal which came in its way.

Abnormally shy, the Gorilla is seldom seen even by the natives of the regions where the great ape makes its home; more than one traveller has gone to Africa specially to gain information at first hand, and has failed to encounter it. Notwithstanding its size, the animal spends most of its time among the trees. Its agility amid the branches is in marked contrast to its ungainly progress upon the ground, where it usually walks on all fours with its fingers doubled up, so as to rest its weight upon its knuckles. It may be remarked that when the Gorilla attempts to walk upright, its great toe affords it a firmer footing than is the case with some of its nearest relations.

The Gorilla figures largely among West African superstitions, for its great strength, ferocity, and pitiless cruelty cause the natives to believe that the animal enshrines the spirits of the most redoubtable negro kings. Their terror of the ape is not without cause, for it is a fact that the animal need fear only the leopard and the lion;



PLATE II

Silvery Gibbon
Chimpanzee



and, unless they take it unawares, either of the carnivores, though in the end victorious, suffers more than a little in the encounter.

A native hunter without firearms is never a match for a full-grown Gorilla ; a single blow of the huge paw will crack a man's skull as if it were an eggshell ; and at close quarters, whether the foe be man or beast, the ape hugs its opponent in a fierce clasp, while it tears away with its great fangs. Hunters who have missed fire, have found the animal rush in, and, between its powerful jaws,



YOUNG GORILLA

spoil the mechanism of the weapon ; but it is scarcely credible that the gorilla can snap a rifle-barrel in two, unless it be one of the cheap, shoddy guns supplied to natives by European traders.

Geological records prove that this gigantic ape existed on earth long ages before the creation of man, but the animal of to-day is no whit more intelligent than its earliest forbears. Whatever structural similarity there may be between man and the ape, there can be no comparison in intellect. Man ever progresses onwards and upwards, but the brute remains at a standstill from the beginning to the end of time. It is a fortunate thing for the African

natives that an animal, possessing such strength, activity, cunning and sanguinary malevolence, does not command corresponding mental powers, or by combination the Gorilla long ago could have driven out of the land any human beings who were without the advantage of firearms.

THE CHIMPANZEE (*Anthropopithecus troglodytes*)

The home of the Chimpanzee is in the same regions of West Africa as the last-named, but its range is considerably more extensive, reaching at least to the western head-quarters of the Nile. It is smaller than the gorilla, measuring only from four to five feet in height, but its legs are longer in proportion. The colour of its coarse hair is much the same, but there is a thin sprinkling of white hairs over the muzzle, and the yellower skin of the face is fringed with a small beard. The hair on the forehead is often parted with considerable exactitude. The ears are large, and project at right angles to the face.

The countenance of the Chimpanzee is markedly mild in expression; the cranial ridges are less prominent; the jaws are not unduly powerful, and the canine teeth are less in evidence. A peculiarity of the head lies in the projecting muzzle, the preponderance of the face and jaws over the brain skull. A view of the profile not only clearly shows this formation, but also draws attention to the flat nostrils, which is one of the chief characteristics of the simian countenance.

The Chimpanzee is a forest dweller, but spends most of its time at the foot of trees rather than among the branches. Except when the female is rearing her young, for which purpose a platform of branches is weaved to provide comfort and some measure of safety, the animals live in a social state; and a colony of Chimpanzees becomes a serious matter in the vicinity of banana, plantain, or papaw plantations, or where cereal crops are growing. A party of animals bent upon plunder calls for extreme watchfulness on the part of a planter, for the animals act in strict unison, second only to that of human beings; and always a watchful sentinel is posted, to give prompt warning if anything suspicious appeals to its sight, hearing, or smell.

Although the Chimpanzee has neither the enormous strength nor the almost fiendish ferocity of the gorilla, by its methods of combination it tyrannises over the natives in the regions which it inhabits, and even single-handed puts up a good fight against the leopard; the lion easily accounts for the ape, but Livingstone assured us that it will not eat the dead body.

With whatever superstition the African native may view the gorilla and the Chimpanzee, he regards the young ones as a welcome addition to his larder, whenever he can procure them. A full-grown

ape is too redoubtable an opponent to engage in open combat merely with the idea of obtaining monkey cutlets. Consequently, the native has recourse to traps, and under cover of darkness dogs are often employed to stampede the apes into nets, in which their limbs become entangled, until the vigorous use of stout clubs puts an end to the captives' struggles. One weakness of many of the monkey tribe is a liking for spirituous liquors, which the hunters place in jars for consumption during the night. Morning light often reveals a fair number of deluded animals sleeping off the effects of their debauch; and they awake to find themselves securely tied up in readiness to grace the native festive board.

Of the whole Monkey tribe the Chimpanzee is not only the most human in appearance, but is the most imitative of man. In a wild state the creature will arm itself with a stick, although it cannot stand upright securely enough to wield the weapon with any effectiveness. In captivity, especially when young, it is docile and teachable to a degree. In various zoological collections there have been so-called educated Chimpanzees, which have greatly diverted the visitors with numerous tricks; but our insular climate plays havoc with the lungs of a creature accustomed to breathe the heated air of a tropical climate, and but few members of the family live many years after crossing the Channel before they are seized with a short, hacking cough that is the sure sign of the approach of consumption.

Within the last few years have been exhibited trained Chimpanzees, not only garbed as men down to shoes, and collar, and tie, but sleeping in an ordinary bed, and sitting at table and handling a knife and fork as though to the manner born. Imitativeness, however, need not indicate any great degree of real intelligence. When such an animal is on view the trainer may not be in evidence, but it is only under his eye that the ape will go through what is but a mere performance. But for that watchful eye, and the certain consequences attending a lapse of manners, the Chimpanzee would certainly sit in the middle of the table and mix up the courses at its own sweet will.

Imitativeness we may find more or less in all the monkey tribe, but practically never discover one that will show the least initiative. Any ape, for example, can appreciate a fire, and, finding one, will cower over it until the last spark has fled; but it will fail to exhibit sufficient intelligence to replenish the dying embers, even though it be sitting upon a store of fuel.

THE ORANG-UTAN (*Simia satyrus*)

The Orang-Utan is a native of Borneo and Sumatra. It rarely exceeds four feet in height, and its brown skin and long reddish chestnut hair render it easily distinguishable from the preceding

animals. The adult male has rather a repulsive face, for not only do the jaws project, but callosities on the cheeks render the protuberant, bluish-tinted face, with its straggling beard, positively hideous. The arms are of such length that, when the animal stands erect, its hands very nearly touch the ground ; the hands and feet are very long, but the thumb and great toe are markedly short, and not infrequently the latter lacks a nail, and sometimes even a second joint.

On the ground the Mias, as the natives call the Orang, is ex-



YOUNG ORANG-UTANS

ceedingly awkward ; it can only hobble in an upright position upon the outside edges of the feet, by throwing its long arms over its head to preserve its equilibrium ; but quite a common method of progression is for the animal to place its hands upon the ground, and swing its body between its arms as if they were crutches.

However awkward it may be upon the ground, the Orang-Utan is thoroughly at home among the trees, where it moves about with a facility quite astonishing in so large a creature. It is chiefly by means of its long, muscular arms that it passes not only from branch to branch, but swings itself considerable distances from tree to tree. The animal enjoys its marked freedom of arboreal

movement owing to a peculiar structure of the hind limbs, which are very loosely jointed to the hip bones, and are destitute of the strong ligament, the *ligamentum teres*, which in man binds the thigh bone to the hip bone to afford him the steady tread that so distinguishes the human being from the ape.

The Orang-Utan habitually interweaves the branches of trees to form a fairly strong platform upon which it mopes away the greater part of the day. A female, when wounded by hunters, has been known within the space of a minute to weave one of these platforms of sufficient strength to support her body, when she lay down to die.

Most of the monkey tribe are social creatures, delighting in deafening conversaziones; but the Orang-Utan is more or less a solitary and silent animal, not even forming, like the gorilla, small bands or family parties.

Like most of the larger apes the Orang-Utan is quiet, docile, and even affectionate when young; but with increasing years it becomes sullen at the best of times, with frequent lapses into violent paroxysms of rage. A young Orang on board ship afforded capital opportunities of learning many traits in its character. At first it was confined in a cage, but it broke the bars and obtained its liberty. It was captured and secured by a chain, which it contrived to detach from the staple, coiling the links round its shoulders, so as not to impede its movements. This pertinacity was ultimately rewarded by being granted the full freedom of the vessel; and very speedily it would take liberties with the sailors and then escape to the ropes by means of its natural agility. Although usually very gentle, it was easy to irritate the animal, when it would show its teeth and attempt to bite anybody nearest to it. It learned artificial tastes of civilisation, and preferred tea and coffee to water. This interesting animal survived the English climate for about eighteen months, and then succumbed to the usual foe of the monkey race, although the disease was probably promoted by the shedding of its teeth.

THE GIBBONS

The Gibbons, which are smaller and less man-like than the other Anthropoid apes, inhabit India, Siam, and Malaysia generally. They are slender animals, rarely exceeding three feet in height, and possessing arms sufficiently long to touch the ground, even when the creatures are standing erect, which some are better able to do than the larger apes. On the hinder quarters are singular callosities, although they are small and hidden by the fur, instead of being exposed, as in the case of the baboons and several other species. The best-known of these arboreal apes are the White-handed or Lar Gibbon (*Hylobates lar*), the Agile Gibbon (*H. agilis*), the Silvery Gibbon (*H. leuciscus*), and the Siamang (*H. syndactylus*).

They vary considerably in colour, from black to cream, and some have a white band on the forehead or around the face. In all of them the hair is thicker and finer than in the larger apes, and is, in fact, decidedly more woolly than is the case with most of the monkey tribe.

The frames of the Gibbons are modelled for rapid movement, their enormously long arms, broad shoulders, and capacious chest being in marked contrast to the smaller hinder limbs and thin flank. The rather small thumb is without the muscular prominence known as the 'ball,' is scarcely opposable to the fingers, and is placed in the same direction as the fingers themselves. The hand thus becomes a powerful hook by which not only to hang on to a



SIAMANG

branch, but to swing the animal from one place to another without any real grasping.

Their shyness and remarkable quickness among the trees render them exceedingly difficult to observe. The powers of the Agile Gibbon, for example, are best exhibited when the animal is startled. Flitting at once to the top of the tree, the creature seizes a suitable branch, and, swinging itself once or twice to gain the necessary impetus, flings itself through the air to another branch like a stone from a sling; and thus with leaps of thirty and forty feet, puts itself beyond the reach of danger almost with the ease of a bird. The Gibbons have not inaptly been called the swallows of the monkey race.

Any monkey is usually an accomplished gymnast, but the superiority of the Gibbons was well illustrated on board a ship where several species had the run of the deck and rigging. A Siamang was the terror of its companions when he was bent upon mischief. He would seize one by the tail, and spring into the rigging with his struggling captive, dragging it from point to point, regardless of its cries and struggles. Even if some of the monkeys took joint action against him, his wonderful agility never failed to baffle pursuit, for he would run along a cord with more than Blondin ease, and, when apparently cornered, would, with unerring precision, leap from one dangling rope to another in a way that none of his tailed victims could emulate.

FAMILY: CERCOPITHECIDÆ

The remaining members of the monkey tribe in the Old World exhibit marked differences in outward form, which render them easily distinguishable from the more man-like apes. The arms are delicate and well-proportioned, and are never longer than the legs; but the distinction that forces itself upon the attention is the tail, which is usually extremely long and slender in proportion to the body, though in the baboons it is short, and in a few species altogether absent. Some of the monkeys are furnished with cheek pouches, and the callosities on the hinder quarters are more obtrusive.

In all of these animals there is less doubt of their real quadrupedal nature; they run on all fours, like a dog, and seldom adopt an erect attitude except when reaching overhead. Even when they do stand upon their hind feet, the long tail pretty effectively dissipates that grotesque resemblance to the human form, which is more or less painfully exhibited in the bigger tailless apes.

The sub-family Semnopithecinae is marked by the long tail, the legs longer than the arms, with very slight or no development of the cheek pouches. The species are few in number, and are but little known in captivity in our country.

SUB-FAMILY: SEMNOPITHECINÆ

THE HANUMAN MONKEY (*Semnopithecus entellus*)

The Hanuman Monkey, or Entellus, has a body which measures not more than two feet in length, to which is appended a tail a little longer. The fur is greyish brown with a dark brown line extending along the back and over the loins; the face and ears are black. Of all the monkey tribe this animal is the most fortunate, thanks to the fact that the Hindus ascribe to it certain sacred qualities, which belief brings greater security of life to the monkey

than many human beings can claim in the regions which the holy animal inhabits.

For long ages the Hindus have believed that various animals are the visible incarnations of their gods, and that Vishnu chooses the Entellus for his earthly tabernacle. Consequently, all temples dedicated to Vishnu are happy hunting-grounds for these favoured monkeys, which swarm without let or hindrance over even the holiest shrines, where the jabbering creatures wax fat upon the offerings of the faithful. Monkeys are never slow to spy out an advantage, and thus Vishnu's favourites make free of a village or city with as much assurance as if they had built it for themselves, and the Hindus were allowed there on sufferance. There is no limit to their boldness and impudence, and knowing that they will not be punished for any delinquency, the artful creatures lay heavy toll on fruit stalls and pastry-cooks' shops, and, indeed, freely help themselves to anything which attracts their vagrant fancy. White residents in India view the sacred monkeys as an unmitigated nuisance, but it behoves them to exercise chastisement only in private; fanatical mobs upon some occasions have killed the persons who have laid sacrilegious hands upon Vishnu's monkeys.

Sometimes the ravages of these monkeys have driven even the long-suffering Hindus to take mild measures against them. They have purchased a fertile tract of land and cultivated it solely to provide food for the monkeys, which were carefully transported to their new quarters. The Hanuman, however, knows where it is best off, and has seldom failed to return to the delights of town life.

THE WHITE-THIGHED GUEREZA (*Colubus caudatus*)

The White-thighed Guereza is a native of East Africa, and very much resembles a long-coated goat, with a long tail heavily tufted with white hair. The back, shoulders, crown of the head, the limbs, and part of the tail are black, which along the sides abruptly changes into white, while across the forehead a narrow white band develops into a handsome ruff on the sides of the cheeks. Altogether the coat is an attractive study in black and white. The Guereza (*C. vellerosus*) illustrated, inhabits Western Africa. Its distinguishing features are the white tail and the silvery white thighs.

The Greek word *Colubus*, meaning 'stunted' or 'maimed,' is applied to this genus, because the thumbs of the fore-limbs are rudimentary, and sometimes altogether absent. Some species are black or yellow, but in all of them the hair is long and silky.

Though the Guereza feeds on fruit and vegetables, it is mild of manner, and not given to ravaging the plantations of the natives. Guereza skins are in great request in Abyssinia, and chiefs of distinction trim their shields with the white, silky fringe, just as in other parts of the world ermine is the symbol of high rank.



WHITE-THIGHED GUEREZA

THE PROBOSCIS MONKEY (*Nasalis larvatus*)

The Proboscis Monkey, a native of Borneo, has an enormously lengthened nose, which gives the animal a very unattractive appearance. In size it about equals the entellus, but its thick fur is much more beautifully coloured. The body is principally a bright chestnut-red: the sides of the face, part of the shoulders, and underparts being of a golden yellow.

SUB-FAMILY CERCOPITHECINÆ

The sub-family Cercopithecinae includes numerous species, the majority of which inhabit the forest regions of Africa. Many of them are slender in build, and when they ravage plantations they

exhibit considerable intelligence and cunning ; for example, they pass or throw fruit from hand to hand until it reaches a spot where it can be consumed at leisure. This passing of objects from one animal to another is characteristic of many monkeys, which was once rather astonishingly impressed upon a lady in Simla, whose little dog often chased the sacred monkeys of the neighbourhood. One day, when the dog was passing under a tree, a long, hairy arm shot down and seized the lady's favourite. None too gently he was passed from one monkey to another up a mountain side, where he was hurled into a deep gorge.

All the remaining Old World monkeys possess remarkably developed cheek pouches, often out of all proportion to the size of an animal. They form natural cupboards in which the monkey can store surplus food, without the embarrassment that would be entailed in carrying it in its hands.

THE GUENONS

The French term *Guenon* signifies one who grimaces, and is applied to a group of African monkeys that are popular inmates



GREEN MONKEY

of menageries and shows, in addition to which peripatetic organ-grinders enlist their services to attract the pennies of the charitable.

The word 'monkey' is derived from the name of one of this group, the Mona (*Cercopithecus mona*) of West Africa. The

diminutive of Mona is 'Monikin,' and hence our word monkey is an easily understood transition. "If elegance of shape, gracefulness of movement, gentleness, and simplicity of character, united with penetration and intelligence of expression, can inspire affection and admiration, all these qualities are united in the small group of monkeys allied to the Mona." The fur of this monkey is principally blackish olive on the upper parts, and almost pure white below. A striking feature is a transverse streak of nearly white hair across the forehead, the naked, purplish skin of the cheeks being partly hidden by the straw-coloured side-whiskers. The animal is about the size of an ordinary cat.

THE GREEN, VERVET AND GRIVET MONKEYS

The Green Monkey (*Cercopithecus callitrichus*) derives its name from the peculiar sheen of its fur. Each separate hair is black and yellow in alternating parts of its length, but under the microscope the black shows a tinge of blue which, blending with the yellow, gives a rather olive-greenish hue. It is often called the Beautiful-haired Monkey for, in addition to the delicate marking mentioned, the inside of the limbs and under surface of the body approach to white, while the hairy fringe growing over the side of the face is golden yellow.

The Vervet (*C. lalandi*) and the Grivet (*C. griseoviridis*) are of a more sombre shade, though the hair presents much the same peculiarity as in their green relative. These little animals abound in south and north-eastern Africa respectively. They are agile and swift in their movements, and their quick sight almost invariably descries an intruder while invisible themselves. There may be scores of little heads peering through the branches, and so lithe and cautious are they, that the traveller may



VERVET MONKEY

be quite unaware of their presence. The Green, Vervet, and Grivet Monkeys are fairly intelligent, and are docile and good-tempered in captivity.

A Vervet that was allowed the run of a house was once found busily washing some lace, ribbons, and handkerchiefs which he had purloined from a drawer, and some of the torn and disfigured remnants were already hanging out to dry. One day, having interestedly watched the cook preparing some partridges for dinner, another idea entered the mimic's fertile brain. He proceeded to a pen where his mistress kept pet bantam fowls. He first helped himself to a few eggs, and then, seizing a hen, he carried it to the kitchen, where he commenced to pluck the poor bird alive. This outrageous act led to Mr. Monkey finding himself at the end of a chain, a restriction which he took so much to heart that he refused to eat, and shortly afterwards died.

In their native woods monkeys wage a constant war against the tail feathers of the brilliant and noisy parrots, which inhabit the same regions. The motives for plucking out a feathery trophy are twofold; the first and most obvious one is that of sheer mischief, but the act is also prompted by the fact that the quill is filled with soft material, which the monkeys suck with much relish.

THE DIANA MONKEY (*Cercopithecus diana*)

The Diana Monkey is a richly dressed animal with a body twenty-four inches in length, and a tail a little longer. The back is chiefly of a deep chestnut colour, relieved on the abdomen and the inside



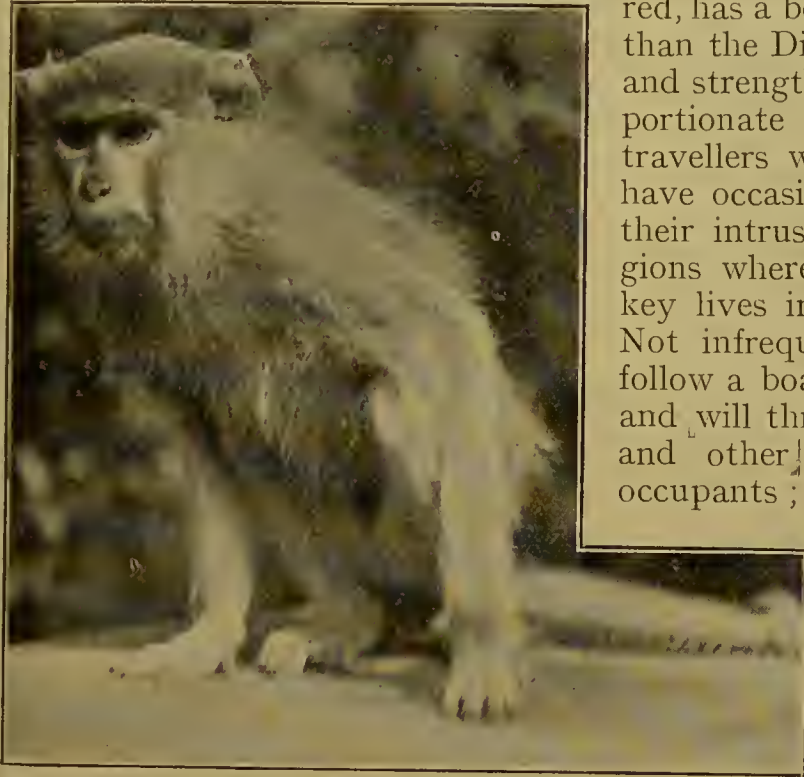
ROLLOWAY MONKEY

of the thighs by a bright orange hue; and the chestnut and orange are separated by a band of white that throws up both colours to excellent advantage. From the chin depends a sharply pointed beard, of which the quaint little monkey is very proud, taking

care when drinking not to draggle it. It may seem strange to name a bearded monkey after a goddess, but the animal's forehead has a white semi-lunar line suggesting the silvery crescent carried by Diana of heathen mythology. The Rolloway Monkey is scarcely distinguishable from the namesake of the goddess.

THE PATAS OR RED MONKEY (*Cercopithecus ruber*)

The Patas or Red Monkey, with fur of a bright chestnut or fawn colour, shading almost into red, has a body a foot longer than the Diana. If its size and strength were only proportionate to its bravery, travellers would sometimes have occasion to remember their intrusion into the regions where the Red Monkey lives in great colonies. Not infrequently they will follow a boat along a river, and will throw fruit, sticks, and other missiles at its occupants ; and sometimes



freedom from annoyance can only be secured by killing quite a number of the monkey assailants.

PATAS MONKEY

THE WHITE-NOSED MONKEY (*Cercopithecus petaurista*)

The White-nosed Monkey has not only an almost triangular white spot on the tip of the nose, but the face is surrounded by a white fringe to complete the air of quaint conceit. The main colour of the fur is olive-green, flecked with yellow ; the underparts are white. It is a native of Guinea and Sierra Leone, and is one of the smallest of the Guenons. It is a graceful little creature, playful, but petulant and coquettish, and profoundly sensible of the admiration which its pretty antics always excite in spectators.

Nearly all the Guenons are amusing, active, and graceful creatures. In captivity they are remarkable for their mercurial temperament, their ingenuity in devising and executing small malevolent pranks, and their insatiable appetite for nuts, and other similar dainties. They are curiously sensitive to ridicule, and easily excited by

mocking gestures or sounds ; in fact, nothing seems to irritate a monkey more than a grin and a chatter, in imitation of its own habits.

THE MANGABEYS

On account of the white hue which marks the eyelids, the Mangabeys are often called the White-eyelid Monkeys. Externally they resemble the guenons, but owing to certain peculiarities in



HAMLYN'S MANGABEY

some of their teeth they more nearly approach the macaques.

The Mangabeys are particularly interesting little monkeys, only about a foot and a half in length, with a long tail, which they usually bend backwards over the head. They have a strange way of writhing their faces into a quaint grin, almost as if they were laughing. Few monkeys can assume more remarkable attitudes than these little creatures, and they seem to be quite aware that their contortions will bring in a supply of nuts, cake and fruit to their exchequer ; so while they execute a series of agile gambols

they keep a vigilant eye on the visitors, in the hope that suitable reward will sweeten labour.

The White-collared Mangabey (*Cercocebus collaris*) wears a white frill or ruff. The Sooty Mangabey (*C. fuliginosus*) is mainly black in hue, the underparts being ashy. Hamlyn's Mangabey (*Cercocebus hamlyni*), as may be seen from the photograph, possesses all the quaint characteristics of the white-eyelid group.

THE MACAQUES

The Macaques, with the exception of one North-west African species, are Asiatic monkeys, of stouter build than the mangabeys. Their habitat is wide, from India to Japan, from the Himalaya to

Borneo. They live in troops, and are remarkably quiet except when they emit a harsh shriek of alarm. Generally they are rather amiable creatures that easily learn to perform tricks ; but in a wild state some of the older males of the larger species will show fight, and will deliberately charge human beings who molest them in the forests.

THE PIG-TAILED MACAQUE (*Macacus nemestrinus*)

One of the best known of a large number of species is the Pig-tailed Macaque, which is chiefly light fawn in colour, with a dark brown tint washed over the top of the head and along the back. The cheeks, the underparts of the body and the tail are of a lighter tint. This animal is an inhabitant of Sumatra, where the natives turn its imitativeness to good account. The monkey is caught when young and is trained to collect cocoanuts for its master, climbing the lofty palms, and selecting only the matured nuts. In other parts of the world the natives often save themselves trouble in the collection of various fruits by taking offensive action against the monkeys that frequent the wild fruit trees ; they throw stones at the nimble creatures up aloft ; and the reply is a perfect fusillade of fruit, which is the only ammunition within the monkeys' reach.

The Pig-tailed Macaque bides its time patiently when meditating an attack upon some unsuspecting person. On one occasion a young lady happened to pass near a cage where one of these animals was confined ; but the monkey betrayed not the least emotion, and gave no sign that his heart was fixed on the white feathers which she bore in her hat. He held out his paws for nuts, cracked them, ate the sound kernels, and flung the bad nuts at the donors, until the owner of the feathers incautiously approached within reach of the cage. Almost too quickly for the eye to follow, Mr. Pigtail, with a single adroit movement, whipped out one of the feathers, and leaped to the back of the cage. Seating himself on the floor, he gravely inspected his prize, smelt it critically, and bit off little strips of feather to ascertain the flavour. Having satisfied himself on these points, he stuck the feather behind one of his ears, and, thus accoutred, paraded the floor of the cage with stately pride.

THE WANDEROO (*Macacus silenus*)

This animal is found chiefly in Ceylon, where the natives believe that all the other monkeys pay the most profound reverence to the Nil Bhunder, or Black Monkey, as it is called. There is no mistake about the creature's dignified aspect, its head being surmounted by a heavy peruke, while its grey beard seems as if blanched by the burden of many years. The animal is rather less than three feet in length from its nose to the tip of its tufted tail, and though it weighs as much as eighty pounds, its disproportionate

beard gives it the appearance of a much bigger animal. The cheek pouches are very well developed, and the Wanderoo is in the habit



WANDEROO

of filling them before it commences to eat, which leads one to suppose that the monkey is feeding voraciously, when, as a matter of fact, it has not commenced to satisfy its appetite.

The Wanderoo in a wild state is reserved in disposition, and does not seek the notice of mankind. In captivity it is capricious, mild in demeanour at one moment, and then, without apparent motive, indulging in a fit of passion, and attempting all kinds of malicious tricks. Many of the monkey tribe, with advancing years, lose the gentle part of their nature. At a year old they may be docile, and even affectionate; at two years they are alternately playful and capriciously angry; and at full age show nothing but a taciturn demeanour, awaiting only an opportunity of giving effect

to their savage and revengeful desires.

THE BARBARY APE (*Macacus innuus*)

The Barbary Ape, with a clear yellowish-grey coat, is more dog-like than any of the animals hitherto described; a full-grown male measures about a yard in length or about the size of a good bull-terrier dog, with a mere stump of a tail that does little more than show where the appendage ought to be. Though it is a North African animal it has become naturalised on the Rock of Gibraltar, the only member of the monkey tribe found in a wild state in Europe. At various periods the European animals would have died out if they had not been replenished by importations from the other side of the Mediterranean, which points pretty conclusively that in the first instance the Magot, as it is called, was introduced into Spain by the Moors.

The very nature of the Rock of Gibraltar suggests that the Barbary Ape is at least only partly a vegetarian, and no inconsiderable

portion of its diet consists of lizards, scorpions, and insects generally. To any ordinary animal the scorpion would be rather a dangerous prey, and would probably avenge its death most fully by a stroke of its swift-lashing and torture-giving tail. The Magot, however,



BARBARY APE

It has hands which can overmatch it, and no sooner is one of these baneful creatures brought to light than the monkey pounces upon it, twitches off the poison-joints of the tail, and then, grasping the disarmed scorpion, eats it as composedly as if it were a carrot.

THE BABOONS

In the group of animals known as Baboons are the fiercest and most repellent of all the Anthropeida, and their disgusting habits are in strict consonance with their generally unprepossessing appearance. A prominent and distinguishing feature rests in the peculiarly formed muzzle, which ends abruptly, leaving a round and flattened extremity in which the nostrils are situated, instead of being depressed just under the eyes, as in the case of the various apes and monkeys already described. The face is practically hairless, and there are large callosities on the hinder

quarters. The Dog-headed Baboons contain only a limited number of species, and the habits and modes of one are generally applicable to the others.

Baboons are almost absolutely quadrupedal in gait, seldom rearing themselves up unless resting a paw on a convenient support. The ordinary walk is an impertinent jaunty strut, accompanied by a general swagger of the person, and a pretentious carriage of the tail which, with the cunning blink in the deep-set eyes, sums up an indescribable air of effrontery.

Although they seldom walk other than on all fours the Baboons are expert climbers, whether of trees or rocks. They live together in strong companies, on broken ground for preference, and from the district which they inhabit they drive all other animals except the larger carnivores. They feed on roots and fruits, lizards, insects, and any small animals which they can capture.

The Baboon displays more discretion than valour until it is brought to bay, when it is a foeman of whom man or any living animal need beware. Seizing an opponent with its hands and feet, the fierce and repulsive creature bites viciously, and as its great canine teeth in particular have inner edges as sharp as a knife, they inflict a terrible, if not an immediately fatal wound. The fact that a leopard will rarely attack an adult Baboon is sufficient testimony to the latter's fighting capabilities; but, nevertheless, the cunning of the huge cat usually leads to its entire satisfaction. It hangs on to a party of Baboons, until it can snatch up some unobservant young animal, and the older ones will not dare to follow a leopard to its den.

THE CHACMA (*Cynocephalus porcarius*)

The Chacma, or Pig-faced Baboon of South Africa, is one of the best known of the Dog-headed Baboons, attaining the size of a full-grown wolf or an ordinary mastiff, although in strength and prowess it is a match for any two dogs, and hunters evince more care in setting their hounds on the track of the big baboon than they do in the case of the leopard or even the lion.

In raiding for food, the Chacma exhibits the most consummate craft. Even when dogs are on the watch the cunning robbers achieve their end without making the slightest sound to attract the attention of the vigilant sentries. Recognising that an approach in force would certainly lead to disclosure, only a few of the oldest baboons actually enter a plantation, the rest of the band arranging themselves in a long line in readiness for action. The leaders pluck fruit or bite off stalks, and quietly hand the plunder to the nearest assistant; and it is silently passed along the line, until at the end of the burglarious queue there is sufficient food to meet the needs of the party. Although the raiders are on service for the general



Pig-tailed Macaque

PLATE III

Mandrill

Diana Monkey

veal, each animal takes care not to neglect its own individual interest, and choice portions of the plunder are stuffed into its pouches, so that if the foray is interrupted, one that has personally engaged in the exploit makes sure of something for services rendered.

When young, the Chacma is often kept in captivity, and in regions afflicted by drought it sometimes renders human beings inestimable service, for it is an unerring water diviner. To sharpen the animal's natural instinct, it is not only deprived of water, but it is fed on salt provisions to inspire a raging thirst; and then at the end of a long rope it is allowed to hunt for the liquid that will save the lives of perhaps a considerable party. The animal sniffs the air, particularly noticing the direction of the wind, smells roots of grass, and seeks other sources of inspiration to which man has no clue; and it is only on rare occasions that the baboon's mysterious instinct fails to lead the party to the water that will spell release from suffering.

The Yellow Baboon (*C. babuin*), as its name suggests, is chiefly yellowish in tint, and the tail is longer than is generally the case in other species. The Arabian, or Sacred Baboon (*C. hamadryas*), inhabits Arabia, Abyssinia, and the Sudan. It is often figured on the ancient monuments of the Egyptians, who consecrated the unlovely animal to the god Thoth, although it is a little less repulsive in appearance than some of the baboons, especially the one next following.



CHACMA

THE MANDRILL (*Cynocephalus mormon*)

The Mandrill, or Rib-nosed Baboon, is at once the strangest admixture of grotesque embellishment and odious ferocity, almost difficult to believe without seeing the actual animal in a wild state. In captivity its manners may be extremely mild, because the creature's inborn craft teaches it that amiability may meet with immediate reward.

In its native wilds of West Africa the Mandrill attains a height of three feet and, being bulky in proportion, it is the largest of the baboons, as it is the most powerful, and certainly the most violent. The fur is olive-brown in colour, fading into grey on the underside of the limbs, and the chin is adorned with a yellow beard. The face is one of the strangest in the whole animal world. On each side of the snout are two swollen masses of oblique, bony, and deeply-grooved ridges, that are decorated with azure-blue, while the grooves themselves are deep purple in colour. The middle and wider line, between the blue swellings, extending to the tip of the nose, is a brilliant scarlet, and, as if to balance matters, the callosities on the hinder parts are painted a ruddy violet, from which the small tail is uplifted in a pert and upright carriage. Only in the adult male are these chromatic effects seen in their full beauty of size and colour, for the female can boast of only a little blue upon the muzzle. It is significant that the colours glow when the animal is in full health; sickness at once causes a reduction in brilliancy.

The Mandrill is easily the most hopelessly savage of all the Baboons, and ordinary monkey rage fades into insignificance compared to the paroxysms of blind fury to which this baboon is subject, almost without provocation. Its eyes emit a baleful light, and it seems imbued with a demon's strength and malignity; and at such a moment, if it cannot vent its fury upon something or somebody, the animal may fall down lifeless in the midst of the tempest that agitates its brutal mind. Nor is the baboon's anger short-lived; it nourishes a deep-rooted vengeance, which with natural cunning it dissembles until the object of its wrath comes within reach of its spiteful grasp.

Living together in large troops, these powerful animals become exceedingly formidable opponents. They are said to expel the elephant from their haunts. Many hunters would prefer to meet a leopard or a bear in combat rather than a Mandrill; an unarmed man would be quite at the animal's mercy—and mercy it has none. It may be easily believed that the natives of the regions where the Mandrill makes its home, hold the ferocious baboon in wholesome dread.

THE MONKEYS OF THE NEW WORLD

The monkeys of the New World differ in several important particulars from those of the Old. They are usually smaller in size ; their faces project less ; their nostrils are further apart ; there are no cheek pouches, and no callosities ; the thumb, if it exist at all, is not opposable ; and the usually longer tail is prehensile to the greatest degree. The American animals are divided into two families, the true monkeys, the Cebidæ, and the marmosets, the Hapalidæ.

FAMILY: CEBIDÆ

THE SPIDER MONKEYS

Of all the various groups of monkeys in the New World, the Spider Monkeys are the most remarkable. Their limbs are long and sprawling, and the manner in which they twist the soles of the fore-paws outwards, and those of the hind-paws inwards, renders their walk awkward in the extreme. The prehensile tail is equal to another hand. It is furnished with a singularly delicate sense of touch, and the tip of the appendage is often used to hook insects out of crevices, or any other small object which its owner desires. The grasp of the tail is in evidence even after death. If a Spider Monkey be mortally wounded, it will curl its tail round a branch, and will remain suspended, head downwards, until the rigid muscles are rendered useless by decomposition.

The Red-faced Spider Monkey (*Ateles paniscus*), or Coaita, as it is popularly called, a native of Brazil and Guiana, is a capital example that will cover a number of species. It is not a large animal, measuring little more than a foot from its nose to the root of the tail, which is quite two feet in length. The coarse fur is black, long, and glossy ; the face is of a dark, copper colour. The animal does not possess the capacious chest and thin flanks of the gibbons.

The Coaita will merely swing by its tail, or recline for hours in the strangest attitudes without moving a limb ; but if danger suggest the advisability of flight, nothing but a bird could hope to follow it. The usefulness of the tail was proved particularly by Mr. Bates, when he endeavoured to shoot one of these monkeys that was at the top of a tall tree. It fell headlong for about thirty feet when it whisked its tail round a bough to suspend it in mid-air ; it proved that the wound was not fatal, for before the traveller could reload, the Coaita made its escape among the branches.

The Variegated Spider Monkey (*Ateles variegatus*) is similarly typical in build and habits. In its large cage at the Zoo it will

sit for great lengths of time without any semblance of movement, and then, suddenly, will commence a course of vigorous exercises, swinging itself from point to point, backwards and forwards, with a rapidity and exact repetition of movement that suggests the monotonous routine of a machine.



VARIEGATED SPIDER MONKEY

In the valley of the Amazon the natives view the flesh of monkeys as a welcome addition to the larder. Very often they shoot them with arrows tipped with mild poison, the effect of which is only temporary, and allowed to wear off before the animal is killed for food. White men have little liking for the rabbit-flavoured flesh, for the head and hands of a cooked monkey seem to savour of cannibalism ; and it is highly probable that more than one savage tribe has been reported to have a predilection for human flesh, when the native stewpot contained nothing worse than monkey.

There are various groups of American monkeys, some of which contain a large number of species, but the several animals following will include most of their main features.

THE CAPUCHIN MONKEY (*Cebus capucinus*)

The Capuchin Monkey is more correctly the Weeper Sapajou, one of the many species that range right across Brazil. They all differ from the spider monkeys in the possession of less woolly hair, and in stouter and rather shorter tails, with less powers of prehension. The Capuchin Monkey is about a foot in length exclusive of the tail. The coat varies considerably in tint, but is generally golden olive, a whiter fur bordering the face in some individuals, but not in all.

Living in small parties of from six to a dozen, these animals spend the whole of their lives in the trees, except when they descend to drink. Shy and timid, they are easily tamed, if captured young, and as they are intelligent and full of quaint antics, they are frequently adopted as household pets by the natives. The Capuchin takes more readily to coloured than to white people, and is always ready to strike up a friendship with a dog, cat, or pig, often going to the length of using one or the other for an unwilling steed, to the amusement of onlookers.



CAPUCHIN MONKEY

THE RED HOWLER (*Myiotes seniculus*)

Various species of the Howling Monkeys vary in size and colouration, but probably the Red Howler is the best-known of the whole group. Unlike the spider monkeys, the Howlers have well-developed thumbs, but, like them, they have the extremity of the prehensile tail naked on the under surface. Brazil is the headquarters of these monkeys, but they also range into Central America. They are the largest of the American monkeys, and in the shape of the head and face, and not a little in disposition, they may be viewed as the Western representatives of the baboons.

The Red Howler is very nearly three feet in length when fully grown, and the tail often still longer. The colour of the fur is a

rich reddish-brown, with quite a golden lustre when a bright ray of light plays over its surface. The black face of the male has a profuse fringe of longer and deeper-coloured hair. The chief feature of the Howler is its voice, to which a peculiar formation of the hyoid bone gives a drum-like resonance. The animal acts up to its name, and it can easily produce yells that can be heard a mile off. It is asserted that when these monkeys are engaged in their vocal exercises, one of the band acts as conductor of the orchestra, giving the lead to most discordant outcries. Many of the sounds to which the animals give vent are imitations of the cries of other animals, the jaguar, their mortal foe, often being uppermost in their minds, coming in for considerable attention. A company of Howlers contrives to make the night hideous with their dismal ululations, and any deaf traveller in their vicinity, for the time being may be thankful for his affliction.

THE WHITE-HEADED SAKI (*Pithecia leucocephala*)

There are several monkeys known by the name of Saki, and sometimes styled Fox-tailed Monkeys, on account of the full and



WHITE-HEADED SAKI

bushy tail with which members of the group are furnished. A closely set fringe of white hair, rather short in the male, but long and drooping in the female, gives the creature a rather remarkable appearance. The top of the head is black, and the remainder of body and tail is covered with long coarse hair of a blackish brown. The natural food of the Sakis consists largely of wild bees and their honeycombs, and the long hair is a useful shield against the stings of the insects.

The Black Saki and Whiskered Saki have their distinguishing features denoted in their names, and the Red-backed Saki (*Pithecia chiropotes*) need only be mentioned on account of its fastidious

care of its beard. When drinking, the Diana Monkey holds its beard aside with one hand ; but this animal takes even greater precaution : it scoops up the liquid in the palm of its hand, unless it is being watched, when it will drink in the ordinary manner, and wet its beard without compunction. On account of its unusual characteristic, the Red-backed Saki is often called the 'Hand-drinker.'

THE THREE-BANDED DOUROUCOLI (*Nyctipithecus trivirgatus*)

The distinguishing features of the Douroucolis are their owl-like faces, their well-developed thumbs, and their non-prehensile tails. All of them are small in size, and purely nocturnal in habit.

The Three-banded Douroucoli is chiefly a native of Brazil and Guiana. Its general colour is greyish white, which in some lights shows a silvery lustre ; on the forehead are three bands, distinct from one another, running on to the crown of the head. The ears are so slight as to be scarcely perceptible in the thick fur. The animal's sensitive eyes cannot endure the glare of tropical daylight, and it only awakes to activity and energy with the approach of night. After dark, the large dull eyes, that shrank from the dazzling rays of the sun, light up with eager animation ; and the listless limbs are instinct with fiery activity. It is difficult to believe that it is the same little animal which, in the daytime, one can drag out of its hole in some hollow tree, and scarcely waken it. The food of the Douroucoli consists chiefly of insects and small birds, and such is its agile address that it readily catches night-flies as they flit by. Its voice, for so small an animal, is singularly loud ; Humboldt assured us that it resembled the roar of the jaguar, but later travellers describe it as more like the mewing of a cat, accompanied by short guttural barks.

FAMILY: HAPALIDÆ

THE MARMOSETS

Any account of the Anthropoidea would be incomplete without reference to the smallest of the true Primates, the Marmosets, which are the only members of the monkey tribe that have any pretensions to real prettiness. They are all Central and South American animals, many of them smaller than a squirrel. They have not a few features in common with the preceding true monkeys, but there are differences sufficiently marked that make it desirable to place them in a separate family. The American monkeys have thirty-six teeth, instead of thirty-two as in the monkey-like animals of the Old World, and in the number of their teeth the Marmosets follow the Old World fashion. The great toe is furnished with the more or less flat nail of the monkey tribe, but all the other fingers and toes are fitted with claws. A Marmoset

has no callosities, no cheek pouches, and no opposable thumb. The tail is not prehensile, and, unlike that of any animal yet described, is very often banded with alternate light and dark hair.



BLACK-EARED MARMOSET

THE COMMON MARMOSET (*Hapale jacchus*)

The Common Marmoset, or Ouistiti, as it is often called from the sharp whistle which it emits, is only seven or eight inches long, with a tail measuring about a foot. It is thus only about the size of a fully grown rat, but its soft white and reddish-yellow fur, and the white hairs radiating from each side of the face, give it a much bigger appearance. The full tail is marked with almost black rings. None of the Marmosets possess any great degree of intelligence, but the one under discussion makes an engaging little pet, and its liking for insects, especially cockroaches, would make it a useful creature in many houses. A tame Marmoset has been known to pounce upon a living goldfish and to eat it. It would not only take a fly from the hand of a visitor, but would watch their capture with restless impatience.

THE SILKY MARMOSET (*Midas rosalia*)

This exquisite little Marmoset is unsurpassed for grace of form, and the softness and colouring of the beautiful fur. It is also called the Marikina and the Lion Marmoset. To the touch the bright lustrous coat is particularly smooth and silken; it is chestnut in colour, with a golden sheen playing over the long glossy locks.

In a wild state fruit and insects compose its staple food, but in captivity it will eat bread and drink milk, in which respect it resembles many other animals that easily take to a strange diet. The Silky Marmoset is a trifle smaller than the foregoing species. It is fond of company, and can seldom be kept alone for any length of time.

THE LEMUROIDEA

A casual glance at the form of a Lemur might lead one to suppose that it was an ordinary quadruped; but while closer inspection notes the curved slit nostrils like those of a cat or a dog, it also reveals certain resemblances to some of the anthropoids that secure their inclusion in the order Primates. There are anatomical differences that can be perceived by no external examination, but it will be sufficient for our present purpose to note an important similarity: if we except the second toe of the foot, all the fingers and toes possess flattened nails. The teeth are usually thirty-six in number. All of these creatures, whatever the species, are strictly nocturnal and arboreal in habit. They are very harmless and inoffensive so far as human beings are concerned, and against larger carnivorous animals they would be helpless; but to birds, insects, and reptiles, which mainly constitute their food, they are terrible enemies. The word Lemur signifies "a night-wandering ghost," and has been applied to these animals not only on account of their nocturnal habits, but their stealthy, noiseless step, which renders their progress almost inaudible. The section comprises quite a dozen more or less closely related groups, of which the following animals are typical.

FAMILY: LEMURIDÆ

THE RUFFED LEMUR (*Lemur varius*)

This animal, one of the true Lemurs, will serve as an example of seven or eight species, which, however much they differ in the colouring of their fur, are of almost exactly similar habits. The Ruffed Lemur is a study in pure white and jetty black, the colours standing out in sharp contrast, without preliminary shading into each other, while the ruff of long white hair round the neck and the handsome bushy tail complete the animal's air of distinction. The Lemurs are natives of Madagascar, and this, the largest of them, is about the size of a moderately grown cat. The voice is out of all proportion to the creature's size; it is deep and sepulchral, and a company in concert contrive to make a deafening noise that travels a great distance in the still night. The fingers and toes are tipped with soft pads, and being provided with exceedingly dilatable eyes, capable of seeing even in a dark night, the Lemur

has no difficulty in procuring food. The Ruffed Lemur is extremely shy in the presence of man, but if it is pursued it will turn



RUFFED LEMURS

upon its opponent and offer a stern fight, in which its sharp teeth will render the animal good service. It is, however, easily tamed, but will avoid the touch of any but its friends.

THE RING-TAILED LEMUR (*Lemur catta*)

The Ring-tailed Lemur has a body a foot long, and a tail several inches shorter. The more exposed ears show the fox-like appearance of the animal, especially in the long, sharply pointed muzzle and jaws. All Lemurs are very impatient of cold, and for the sake of warmth they lie huddled together, wrapping their tails round themselves and their companions, until it is impossible to tell to which animal any particular appendage belongs. The Ring-tailed species makes a more vivacious pet than the Ruffed one, and it is full of the merriest pranks. It frequently makes a sound similar to the purring of a cat.

The Red, the Collared, the Black-faced, and the White-fronted Lemurs indicate their chief characteristic in their names. The Indri Lemur (*Indris brevicaudata*) is the largest of the whole group. It is two feet in length from the tip of the nose to the stumpy apology for a tail. The Mouse Lemurs are not only very small, some of them only four inches in length, with a tail of six inches,

but they differ considerably in habits. Some of them hibernate during the hottest portion of the year, spending their long sleep in particularly neat and comfortable nests of twigs and soft substances. These smaller creatures are chiefly vegetarians; they are shy and wild, and cannot be tamed even in a long captivity.

THE MAHOLI GALAGO (*Galago maholi*)

The Galagos form a peculiar group of Lemurs, with large membranous ears projecting from the delicate woolly fur, which varies in colour in different species. They are found over nearly all Africa, but the Maholi Galago, which is common in some regions of British South Africa, is one of the best known. The animal is mainly a fruit-eater, but its slender paws unerringly catch any flying insects that come within reach. It always makes an interesting captive in zoological collections. The

photographwell shows the large eyes, which exhibit that peculiar lustre which is commonly seen in the organs of sight of nocturnal animals.



MAHOLI GALAGO

THE SLENDER LORIS (*Loris gracilis*)

This animal, with delicately slender limbs, tailless, and only nine inches in length, is one of the group of Slow Lemurs, of which there are several species. Its light grey fur displays the length of the limbs. In the forest regions of Southern India and Ceylon it may be seen sleeping during the day "rolled up in a ball, with its head between its legs, grasping its perch with its arms." Night is the time when the Loris awakes from its daily slumbers. Its movements are slow and silent; and, alas for the poor doomed bird, sleeping with its head snugly sheltered by its soft feathers, that has attracted the fiery eyes of the Loris. As silent as the shadow on the dial it steps along the bough, until it stands by the side of the unconscious victim. Suddenly the slow caution is exchanged for lightning speed, and with a movement so rapid that the eye can hardly follow it, the bird is torn from its perch and fiercely devoured.

Two more animals belonging to the Lemur group remain to be described, but they differ so greatly, not only from the preceding



SLENDER LORIS

animals, but also from each other, that they have to be referred to different families, each of which contains only one species.

FAMILY: TARSIIDÆ

THE TARSIER (*Tarsius spectrum*)

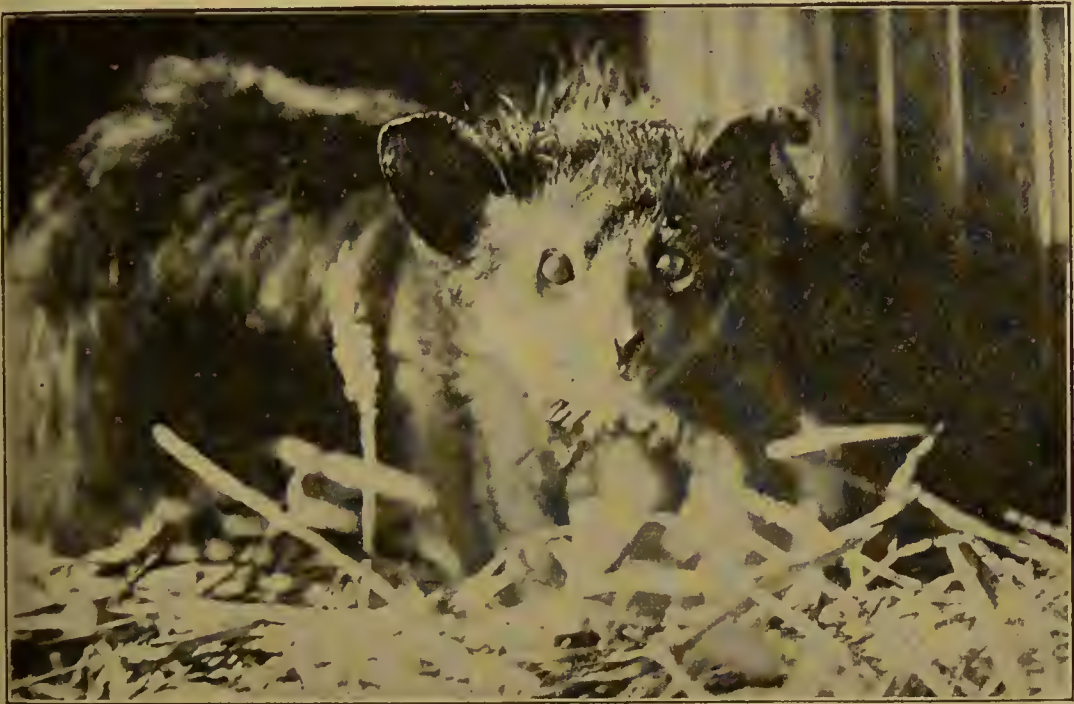
The Tarsier is a somewhat rare little animal even in the Malaysian islands where is its home. It derives its name from a considerable elongation of the bones composing the 'tarsus,' or back of the hands and feet, while its specific name refers to its spectre-like appearance. The second and third toes of the hind foot are clawed, but all the other fingers and toes have nails. The hands and feet are furnished with soft cushions, which assist the animal to gain a firm hold of the branches amid which it leaps almost with the agility of a frog. The colour of the fur is brownish fawn, and there are dark rings round the eyes. The natives of Malaysia look upon this animal with ingrained dread.

FAMILY: CHIROMYIDÆ

THE AYE-AYE (*Chiromys Madagascariensis*)

The Aye-Aye is rare even in Madagascar, its native home, in fact, when Sonnerat, the French naturalist, discovered it in 1780, it was practically unknown to the natives. It is so strange an animal that zoologists have been puzzled how to classify it. The feet are decidedly monkey-like in character, even to an opposable big toe on the hind foot; but the hands cannot be compared to those of any other animal, for while all the fingers are long,

the middle one is attenuated to a degree. The teeth of the animal, too, are very contradictory ; there are no canines, and the arrangement of the incisors suggests the rodent, except that they are sharply pointed, instead of having chisel-like edges. Again, the apes and monkeys clasp their young ones in their arms, when they are suckling at the breast ; but in the Aye-Aye the mammae are placed in the lower part of the abdomen, and consequently a young Aye-Aye obtains milk only in the same manner as the ordinary quadruped.



AYE-AYE

The full-grown animal is about three feet in length. Its rusty brown coat deepens almost into black on some of the upper portions of the body, while the underparts are of a light grey. During the day the Aye-Aye lies curled up in the dark hollow of a tree, from which, at night, it issues in search of food, especially grubs and insects, which it probes out of the narrowest crevices with its wire-like middle finger. The accompanying photograph very plainly displays the brownish-yellow, spook-like eyes, which assist one to understand why the inhabitants of Madagascar view the animal with superstitious horror. They firmly believe that anyone touching it will certainly die within the year, which helps to make it a matter of some difficulty to ascertain accurate details concerning the creature's life history.

ORDER: CHIROPTERA

THE BATS

The word 'Chiroptera' is derived from two Greek words, one of which means a 'hand,' and the other a 'wing,' and consequently the Bats are 'hand-winged' animals. These enigmatical beings sorely puzzled the early naturalists, some of whom classified the creatures as birds, because they could fly, while others dubbed them quadrupeds, because they could walk; and when at length they were viewed as mammals, they were placed at the end of the list, as though they formed a connecting link between fur and feather.

One is never in danger of mistaking the Bat for any other animal. It has four limbs and a tail, the fingers of the front limbs being remarkably elongated, to serve as supports for a thin, semi-transparent membrane, which is a prolongation of the skin of the flanks. The arms themselves are incapable of a rotary movement, but the skin-enshrined fingers are able to beat the air with the steady strokes necessary for maintaining flight. The short thumb is armed with a strong, projecting hook-like claw, by means of which the Bat can attach itself to any convenient object, as well as help itself along a level surface. The hind limbs are singularly weak and ineffective; they are much shorter than the fore ones, and the feet are quite free from the additional membrane between the hind legs, and which often includes the tail. The body of the smaller Bats much resembles that of a mouse, even to the soft fur; but the membranous, wiry expansions are leathery and flexible and practically hairless. 'Flittermouse' was the English name for the Bat ages ago, and it has also not inappropriately been called the 'Leather-flapper.'

The Chiroptera are divided into two sub-orders, the Microchiroptera or Insect-eating Bats, and the Megachiroptera or Large Bats, in which are included the frugivorous species. The former are the more numerous, and there are few parts of the world where some species or other is not to be found, even to the remotest islands of the Pacific, where the Bats are the only indigenous mammals. With few exceptions they are uniformly dull in coloration, and the chief points of difference between any of the species are usually confined to various facial characters; not a few of the creatures have a membranous development on the muzzle which is commonly known as a nose leaf, while in some the ears are membranously expanded into such lengths that they can be folded up almost as though they were wings. The ear and nose of the Bat are always highly developed organs of extreme delicacy, and closely connected with the animal's almost supernatural sense of touch.

The Bat can thread its way amid boughs of trees with a facility

that seems quite beyond the power of sight, especially when one considers that its evolutions take place in the absence of light. This curious power led to an interesting experiment to ascertain by what means the Bat is enabled to avoid collision with any impediments to its aerial progress. The Bats' eyes were temporarily sealed up so as to render them quite blind, and then they were liberated in a chamber in which were suspended cloths with holes little bigger than the body of a Bat, while strings dangled at intervals all over the room. Though deprived of sight, the Bats flitted about without the least embarrassment, passing unerringly through the holes in the cloths, missing the strings with their flapping wings, turning corners, and even finding cran-



LONG-EARED BAT

nies for concealment. The closing of the Bats' ears appeared to be felt more than the loss of sight, but even this deprivation failed really to affect the tortuous flight among the various obstructions. It was thus evident that in its nocturnal evolutions the Bat is assisted by what is scarcely less than a sixth sense, which really lies in the exquisite nervous system of the wings.

With few exceptions Bats are gregarious, and in some parts of the world their colonies are exceeded in numbers only by the immense flocks of sea-birds, which resort to certain localities in the breeding season.

SUB-ORDER: MICROCHIROPTERA

THE INSECT-EATING BATS

Of the more than four hundred species of Bats, the great majority are insect-eaters, although a few of them add a little fruit to their diet, and a still more limited number suck the blood of creatures bigger than themselves. All of these Bats are small in size and disagreeable in odour, and of no value as food ; owls and the weasel

family prey upon them, but a dog objects to take one up in its mouth. There are a number of structural differences between the Insect-eating Bats and their larger Fruit-eating cousins, altogether too technical and intricate for inclusion in a brief and popular account of the Chiroptera ; but it may be mentioned that in the Fruit Bats the second finger is often furnished with a claw, but on the insect-eaters never ; and while the latter have generally got a tail of considerable length, it is usually absent in the Large Bats.

FAMILY : VESPERTILIONIDÆ

Less than a score of species of Bat are found in the British Isles ; among them are not only the commonest Bats of Europe, but several of them are distributed over nearly all the world.

THE PIPISTRELLE BAT (*Vesperugo pipistrellus*)

The Pipistrelle, the commonest British Bat, is not only small, but it is more a ' flittermouse ' than any other of its tribe. In size, colour and texture of its fur, and its ears, it scarcely differs from the tiny rodent. It is generally this Bat which frequents even towns, hiding in the daytime in trees, church towers, and all kinds of dark recesses. Even if the Pipistrelle were not more abundant than any other species, it lends itself easier to observation. It hibernates for a shorter period than the generality of the British Chiroptera, and it occasionally ventures out in broad daylight ; sometimes this occurs even in midwinter, when possibly the creature has been disturbed from its long sleep, and it sallies forth in the hope of a meal, which the season doubtless sternly negatives.

THE LONG-EARED BAT (*Plecotus auritus*)

The Long-eared Bat is by no means rare in our country, and its range extends over a great portion of the Old World. It is only from two to four inches in length, and has a wing-spread of a foot. Its long ears give it rather a pleasing appearance, and in captivity its curious little traits of disposition are easily observed. Sometimes one of these captive Bats will eat nothing but freshly-cut meat, but another will devour thirty or forty bluebottles in a day, and even then its appetite will be far from satiated. This voracity gives some idea of the usefulness of the Bats in assisting to keep the insect world within due bounds.

FAMILY : RHINOLOPHIDÆ

THE GREATER HORSESHOE BAT (*Rhinolophus ferrum-equinum*)

Among the British Bats which possess the leaf-decorated nose, the Greater Horseshoe Bat is the most conspicuous. The front of the nose-leaf presents the form of a horseshoe, from which there is

a sharply pointed membranous extension on the forehead. This Bat is found chiefly in some of the southern counties, but it is seldom observed, for it is less endurant of light than any of its



GREATER HORSESHOE BAT

British relatives ; and takes up its quarters in caverns so dark that no other species will accompany it, although a *Barbastelle* Bat has been found down a mine seventy feet deep. In any case, the Greater Horseshoe Bat issues later on its foraging excursions and retires much earlier than other species.

With the approach of winter the Bat finds its natural food gradually disappearing, until no flying insects remain upon which to make a meal. Many birds overcome a similar difficulty by migrating to a climate where food is abundant, but the Bat's restricted powers of flight do not allow it to follow this example. Nature provides an alternative. Retiring to some sheltered and dark refuge, the Bat enters into a state of hibernation, a comatose condition between sleep and death, in which respiration and digestion altogether cease. But even a languid circulation which is kept up by one heart-beat per second cannot be maintained upon nothing. Starvation would ensue if the Bat, just before it retires for its long sleep, did not become exceedingly fat, which is the store to make good the loss of tissue in a torpor that seldom lasts less than three months, and in some cases twice as long. Reference has been made to the hibernation of the mouse-lemurs, in which case the animal accumulates a great deal of fat, chiefly near the

base of the tail ; it is swollen to a prodigious size when the little lemur goes to sleep, but it is a very wasted and shrunken tail when it awakes.

FAMILY : PHYLLOSTOMATIDÆ

THE VAMPIRE BAT (*Desmodus rufus*)

In tropical America are Bats that bear a particularly evil reputation. The common blood-sucking Vampire, clothed in reddish brown above and yellowish brown beneath, is only about three inches in length, yet it was reported to be a deadly creature that descended upon sleeping men to suck from an upturned toe so much blood, that frequently the victim died from exhaustion. All Bats are furnished with very sharp teeth, but the long and sharply pointed incisors and lancet-shaped canines of the Vampire make a puncture equal to the bite of a leech. Waterton did much to prove that this Bat was less black than it was painted. For eleven months he slept in a loft which the Vampires frequented, and never once was he attacked ; but an Indian servant had blood extracted from his toes upon several occasions, and an English boy was bitten on the forehead.

It appears that if an animal is only casually bitten any ill-effects disappear in the course of two or three days ; but if it suffer repeatedly the result will be serious. Waterton lived in a house where fowls died fast, and an unfortunate ass was being killed by inches. The animal looked, as the naturalist expressed it, "like misery steeped in vinegar."

The food of the Vampire Bat is undoubtedly fruit and insects, although it may be fond of blood when it can procure it ; a leech, for example, would prefer blood to anything else, but in the whole course of its life may never have an opportunity of satisfying its taste.

In the British Isles it is no unusual thing to find in towers, ruins and rocky caverns, an assembly of Bats running into hundreds. In some parts of the world the Bats are not only larger, but collect in many thousands to occupy the same abode. The droppings of the animals accumulate until it is worth while to remove the Bat guano. The most remarkable Bat cave in the world is probably one in Texas, from which at night it takes the Bats two hours to emerge in a rapidly moving cloud. The guano in this case is periodically removed by means of a specially dug shaft, so that the workmen can complete their malodorous task without disturbing the myriads of Bats that cling to the roof of their dark and noisome retreat.

SUB-ORDER: MEGACHIROPTERA

THE FRUIT-EATING BATS

The largest of the Bat tribe, some of them with a wing-spread of nearly five feet, most of the Fruit-eating Bats are popularly called Flying Foxes, on account of the very vulpine aspect of the head, heightened generally by the red, fox-like colour of the fur. They are not to be dreaded as personal enemies, for unless roughly handled they will not bite animated beings ; but for their assaults upon crops, they are held in no small dread by the agriculturists.

FAMILY: PTEROPODIDÆ

THE MALAY FOX-BAT OR KALONG (*Pteropus edulis*)

One of the best-known of the Fruit Bats is the Indian Fox-Bat, but the Kalong of Malaysia is the biggest of the whole Chiroptera, and its name is quite commonly applied to the largest Bats of other regions. When full grown the Kalong is about the size of a rook, but its enormous wings, when it is flying with a slow flapping movement, give it the appearance of a huge bird of prey, or rather a combination of bird and beast. The long, pointed muzzle gives the head much resemblance to that of a fox, and the full eyes gleam with cunning.

The Fruit Bats live together in immense colonies, and as their diet is wholly vegetarian they work enormous mischief among soft fruit trees, as well as field crops of various kinds ; and planters are hard set to guard their produce against these winged devourers.

The Kalong and various allied species are nocturnal



AUSTRALIAN FRUIT BAT

in habit, but do not retire to dark places in which to spend the day. They merely suspend themselves in the shade of large trees, especially the fig, where they hang in clusters like bunches of huge fruits. If they are disturbed in the daytime, they give vent to sharp screams as they flutter about, their night-loving eyes sadly bewildered by the glare of the tropical sun; and when they settle down again, they fight for their roosting-places very much like birds do when they retire for the night.

Though the planters and the natives of Eastern regions find the Fruit Bats a sore trial, there is some slight compensation in the fact that these Bats are edible. The flesh of the Kalong is white and tender, and some species are said to resemble hare or partridge. The Mosaic law prohibited the Bat as an article of food to the Jews, and various British travellers do not hesitate to say that, given rat or Fruit Bat for choice, they would prefer the rodent without the least hesitation.

The interesting photograph of an Australian Fruit Bat shows the typical characteristics of the sub-order, and if the picture be inverted, the creature presents a quaintly humorous aspect.

ORDER: INSECTIVORA

THE INSECT-EATERS

The animals included in the Insectivora feed almost exclusively upon insects, snails, worms, and similar creatures, and consequently their teeth are of just the formation best fitted for seizing and retaining their prey. Examination of the teeth of a hedgehog or mole shows that there are no flattened surfaces for the purpose of grinding the food; but that even the molars are covered with sharp conical points with which to pierce and crush the hard outer coverings in which many insects are encased.

In marked contrast to the monkey tribe, all the Insect-Eaters have short legs fitted with five toes each; and they are plantigrade in their walk, that is, they plant the sole of the foot flat upon the ground without much speed and little or no springiness in the step.

The term insect-eater must not be taken too literally, for some Insectivores depart largely from the general rule; one exists almost wholly upon fish, another upon worms, and some have developed quite omnivorous tastes. Only a few of the species are tree-climbers, and some of them lead almost a subterranean life. With few exceptions they are nocturnal, and even in only moderately cold countries spend the winter in a more or less torpid state. Though the Insectivora are well represented in the British Isles, from the very nature of their habits they only lend themselves to the observation of the patient and the curious.

FAMILY: ERINACEIDÆ

THE HEDGEHOG (*Erinaceus europæus*)

The common Hedgehog is represented throughout nearly all Europe, and the same or somewhat similar species are found in temperate Asia across the whole breadth of the continent, as well as in some parts of Africa. In our country it is often called the Urchin, Furze-pig, or Hedge-pig.

The Hedgehog is about ten inches in length with a tail of one inch ; its legs are short and yet capable of attaining a fair speed, although as a rule, like most plantigrade animals, it affects rather a deliberate pace. The fore-feet in particular are armed with sharp claws that form very capable digging instruments. The animals'



HEDGEHOG

food covers rather a wide range, and, to use an Irishism, all is fish that comes to the Hedgehog's net, providing it is of an animal character, although nuts and fruits are not despised, if nothing better present itself.

The characteristic of the Hedgehog that immediately strikes the attention is the array of spines with which the back is more or less covered, forming a formidable spiky coat of mail, which at once bids an enemy pause. Although the underparts of the animal are bare of spines, and only covered with a mixture of soft hair and bristles, it can roll itself up into a round ball by tucking in its head, drawing up its legs, and curling its body around those members ;

and in this posture the Hedgehog is practically invulnerable to the attack of every animal foe.

It is interesting to learn how the animal effects this strategic movement. Spread over its back and along its sides is an enormously developed muscle, called the *panniculus carnosus*, which, when contracted, retains the ball-like attitude as long as life remains in the body, no matter what force is employed to unroll it. Nor is the use of the spines limited to defence. They are so extremely elastic that the Hedgehog is able to throw itself from as great a height as fifteen feet, and alight upon the hard ground without the slightest inconvenience. The chief economic use of the quills is for anatomical pins, which, unlike those of metal, do not suffer from rust when immersed in spirits of wine. The ancient Romans used a Hedgehog skin for hackling hemp before it was made up into coarse cloth. Country people still find the spiny coat of service in the weaning of calves; a piece of prickly skin is bound upon the calf's muzzle, and after one painful experience the mother will drive her offspring remorselessly away, until it learns that its suckling days are over.

The Hedgehog pairs for life. The nest is an admirable structure of woven moss and grass, and so thatched with leaves that it is impervious to a violent shower of rain. Three or four young ones are produced at a birth, and as the spines are soft and white and few in number, inexperienced persons have sometimes mistaken the little creatures for young birds.

The Hedgehog is very little afraid of the dog, cat, or fox, for these animals rarely desire a second taste of prickly trouble; but in some countries the larger beasts of prey, such as the puma, make short work of the animal, notwithstanding its armoury.

A domesticated Hedgehog is more than an interesting pet; in a very short time it will free a house of cockroaches, beetles, etc. It is very fond of eggs, in which it will make a hole, and with its tongue lick out the contents very neatly. The gamekeeper does not view the animal with anything like affection, for if it happen upon pheasant or partridge eggs the covert will be so many birds short when the shooting season commences. More than this, the prickly Insectivore will devour pheasant, partridge, hare, or rabbit, if it can once get hold of them; and frequently it makes its nest in a rabbit-burrow, instead of in a crevice in rocky ground, or under the gnarled roots of an old tree. Milk escaping from the overfilled udder of a cow waiting to be milked, is greedily lapped up by the Hedgehog, but it does not help itself direct from the teats of animals lying in the fields. Cows are ordinarily placid enough in disposition, but the sharp teeth of the Hedgehog would destroy all equanimity long before the little animal could effect its purpose. No less fanciful is the old belief that it climbs apple trees, returning to the ground with a supply of fruit impaled upon its spines.

The Hedgehog is the sworn enemy of the viper, which it overcomes without receiving any injury in return. It seizes the snake by the tail, and at once assumes a curled-up attitude, and when the reptile retaliates it only cuts its head, as it hisses and twists and makes terrific darts at its enemy. The Hedgehog holds on determinedly, until the viper has hacked its head to pieces against the panoply of prickles. The victor bites the snake's body throughout its entire length at intervals of half an inch, and then, taking the tip of the tail in its mouth, the Hedgehog commences its repast, and finishes the reptile in the course of twenty-four hours.

The Hedgehog hibernates very thoroughly, for animal food does not lend itself to storing up. Because one of these little animals is occasionally found abroad during the winter months is sometimes advanced as a reason for doubting that it hibernates for several months. Nature unfailingly knows her business. Excessive cold will arouse an animal from a semi-animate condition, or it would become benumbed and stiff, and death would ensue. If for any reason the Hedgehog is roused from its winter sleep, it will forage about on the chance of finding some stray food, but in any case quickly returns to its refuge, and again falls into a somnolent condition.

FAMILY: TALPIDÆ

THE MOLE (*Talpa europæus*)

The common Mole, even including its tail, seldom exceeds eight inches in length. The body is cylindrical in shape, to which the head is attached without any semblance of neck, for as the long and sinewy snout is really a boring tool, any marked neck contraction would be a source of weakness. As the animal is chiefly employed in digging for a living, the bones and muscles of the forequarters and forearms are developed to a remarkable extent, in order to work the broad, spade-like claws, with which it digs and throws the soil behind it with a speed that is scarcely credible.

The fur of the Mole is particularly close and fine in texture, the short hairs being so affixed to the skin that the fur lies smoothly in any direction without any particular grain. This peculiarity enables the animal to proceed along its galleries with the necessary celerity, and without soil adhering to its soft, velvety coat, which is commonly black in colour, and sometimes a yellowish grey; and a white mole is by no means a rarity.

The originator of the 'blind as a mole' was not an accurate naturalist, for deeply hidden in the fur are tiny eyes, well protected from the loose mould through which the creature is constantly passing; but what the Mole may lack in sight is atoned for in the possession of remarkably acute smell, probably hearing the movement of a worm quite as quickly as it can scent it.

The well-known molehills vary according to the age and sex of the miner. Sometimes the run is little more than a shallow trench, but deeper in the soil is often found a larger burrow, sufficiently wide to allow two moles to pass each other, and this is one of the high roads, which lead from one feeding-ground to another. The finest mole architecture is to be found in the central fortress, which is inside a tolerably large mound of well-trodden earth. Two circular galleries, one above the other, are connected by various short passages. In the centre of the mound is burrowed a spherical hole which is also connected with the lower gallery. It is in this middle chamber that the mole makes a bed of dried grass and



MOLE

leaves, from which, when danger threatens, it has immediate access to the runs that radiate from the fortress in all directions.

There are various burrowing animals, some of them a considerable size, that can dig out a retreat for themselves in a remarkably short time; but, size for size, the Mole is an excavator without a rival. It is afflicted with a most voracious appetite, and for a mere pittance of earthworms the whole of its waking hours are spent in furious delving. In one night a single Mole has been known to burrow a passage four hundred and fifty times its own length. If a man could only work at the same rate in proportion to his size, twelve navvies, in one night shift, would excavate a railway tunnel four miles long.

Small and harmless as the Mole may appear, in reality it is a most ferocious creature, and with its own kind engages in the most

sanguinary contests upon very slight provocation. Two fighting Moles will become so absorbed in the struggle for the mastery, that they will leave their subterranean passages and finish the battle in the light of day. Should one of the combatants overpower the other, it springs upon the vanquished, tears its body open, eagerly drinks the blood, and enters upon a triumphal feast. The hedgehog, too, is of similar cannibal tastes.

The Mole is apparently a thirsty animal, and in its runs it sinks little wells, so that liquid is generally at hand. It does not work only at night ; it is unable to exist longer than twelve hours without food, and, except under necessity, it never abstains so long ; it often hunts by day, preying upon mice, shrews, frogs, and small reptiles in addition to worms. The Mole's worst natural enemy is the weasel, but molecatchers capture thousands of them, as the fur is in demand for a variety of purposes.

FAMILY : SORICIDÆ

THE COMMON SHREW (*Sorex vulgaris*)

The Shrews, or Shrew-mice as they are quite commonly called, very much resemble mice in general appearance, but a glance at their teeth at once proves their insectivorous character. There are three species of these creatures in the British Isles, and except in Ireland there are few districts where the Common, or Erd, Shrew is not found. This Shrew is not more than four inches in length, of which the peculiar square-sided tail accounts for nearly half. The head is elongated, with a pointed, flexible snout for rooting up the worms and insects upon which it feeds ; but, small as it is, the Shrew will not hesitate to make war upon frogs, lizards, and



COMMON SHREW

even small birds. Its nest of leaves and grass is usually made in a depression in the ground or in a bank, and here from five to seven extremely diminutive creatures are born in the spring.

In the autumn large numbers of dead Shrews are to be found in the hedgerows and ditches. The reason for this marked mortality is a moot point, unless it be that with the colder weather the worms have descended too deeply into the ground, the insects have

concealed themselves in their winter quarters, and the Shrew, like the mole, cannot endure a protracted fast. They certainly have not met their end by the attacks of their natural enemies, the weasel, mole, and owl, or the little carcasses would have been devoured. Owls will capture the living, but appear to leave these dead Shrews severely alone; and while cats have an inborn taste for mice, they never care to eat the musky-smelling little creatures.

The incisor teeth of the Shrew are extremely long, those of the lower jaw projecting almost horizontally. They are most pugnacious in disposition, and for little or no offence work themselves into a fury, and hold on with their rows of bristling teeth with the pertinacity of bulldogs.

In olden times there was a deep-rooted antipathy to the Shrew, whose bite was supposed to be not only venomous, but its very touch a certain forerunner of evil; and if a cow afforded a short supply of milk, or her calf did not thrive, it was accounted a sure sign that she had come in contact with one of the little creatures that "biteth deep and poisoneth deadly." Animals afflicted with 'Shrew-stroke' could only be cured by the application of twigs and branches of the 'Shrew-ash,' a tree in which was bored a hole, wherein to immure a Shrew alive. On the other hand, the little creature was the basis of various weird medicines. It was believed that a dead Shrew, "being burned and afterwards beaten or dissolved into dust and mingled with goose grease," was an admirable remedy for certain inflammations. The tail, cut from a living animal, similarly burnt and pounded, would heal the sore which came from the bite of a ravenous dog, but if the tail were taken from a dead Shrew it had "neither good operation nor efficacy in it."

The Pigmy Shrew (*Sorex minutus*), an inch shorter than the foregoing, though not so common in England, is found in Ireland. It is the smallest of our British mammals.

THE WATER SHREW (*Sorex fodiens*)

The Water Shrew is nearly black upon the upper parts instead of the reddish-brown coat worn by the Erd Shrew; the underparts are beautifully white, and the tail and toes are fringed with stiff white hairs. This Shrew is thoroughly aquatic and can remain under water for a considerable time, when its coat is studded with tiny silver beadlets produced by the minute air bubbles that cling to the fur. These little aquatic animals are very sportive, chasing each other over the ground and through the water, running up the stems of reeds and tumbling off into the water, and playing a thousand little pranks with the most evident enjoyment. Then they will suddenly cease their play, and begin to search after insects with the utmost gravity, rooting in the banks and picking up stray flies, as if they never had any other business in view.

Belonging to an entirely different family, the Macroscelididæ, is the Elephant Shrew of South Africa, an odd-looking little creature with a peculiarly long-pointed nose ; its hinder limbs are longer than the fore-legs, and with the extra large feet form a good support when the creature sits in an upright position. It seeks its food by daylight, and if it is alarmed the hind legs assist it to skim over the ground with great celerity, until it can dart into the perpendicular shaft that leads to its deep, tortuous burrow. There are several species of these Jumping Shrews, as they are frequently called.

FAMILY : CENTETIDÆ

THE TENREC (*Centetes ecaudatus*)

The Tenrec, or Madagascar Hedgehog, is rather more elongated in form than its European cousin ; its legs are longer, its spines shorter, and it cannot contract itself into a ball. Being strictly



TENREC

Nocturnal, the Tenrec's habits are not very well known even in its native home, or in Mauritius and Réunion, where it has become naturalised. The animal is possessed of an overpowering and unpleasant smell of musk ; but this does not prevent the natives of Madagascar viewing its flesh as a rare delicacy. As the animal, with its powerful crooked claws, burrows its den among the old roots of clumps of bamboos, it is no easy task to dig out the protective meal.

FAMILY: TUPAIIDÆ

THE TREE SHREW (*Tupaia tana*)

In the Eastern world, between India and the Philippines, we find the Tree Shrews, which differ largely from the nocturnal burrowers which have been engaging our attention. Seeking their insect prey among the branches of trees in the full light of day, the creatures apparently resemble the squirrel rather than the mole, but the teeth are decidedly insectivorous. The largest of the group is the Bornean Tree Shrew. Its muzzle is lengthened considerably, and the upper jaw, slightly longer than the lower, gives the animal rather a dragon-like aspect. The hair is silky in texture, and is reddish brown in colour with a tinge of yellow. The tail is long and bushy, and looks as if it were specially combed almost into a parting; but not nearly to the same degree as in the appendage of the Pen-tail (*Ptilocercus lowi*), which is bare except at the extremity, where bristly barbs of white hair almost exactly resemble the feathers of an arrow-shaft.

FAMILY: GALEOPITHECIDÆ

THE COBEGO (*Galeopithecus volans*)

The Cobego, Colugo, or Flying Lemur, is a strange creature, whose exact place amongst the mammals has puzzled modern zoologists, quite as much as the bat puzzled the old ones. Some prefer to elevate it into an order of its own, the Dermoptera, or skin-winged animals, and thus view it as a link between the four-handed and the wing-handed animals. It has, however, been pretty conclusively proved that the Cobego approaches very closely to the Insectivores, and in any case, though there are several species, there is but one family, which is found in various of the East Indian islands.

The Cobego is about the size of a rather large common cat, clothed in shortish fur, which, even in the same species, varies from light brown to grey, and sometimes is marked with stripes and spots of different shades. The animal's chief peculiarity is the membranous prolongation of the skin to connect the limbs with each other, and the hinder limbs with the tail. When the animal is walking, the skin expansion is folded closely to the body, but in its flight from spot to spot the Cobego expands its natural parachute to assist it in making a sweeping leap, that is no more true flight than is the dive of a gymnast from one flying trapeze to another. In proof of this the animal must always alight at a lower spot than from which it starts; nevertheless the parachute enables the Cobego to take a leap of seventy yards, in the course of which it descends about one foot in five. The fingers are fitted with sharp

hooked claws, by means of which it suspends itself from a branch in the daytime, waking up in the evening to travel in search of leaves and soft fruits. The tail is prehensile, and doubtless assists to support its owner while feeding. Usually only one young one is born at a time, which clings closely to its mother's breast, and not like the bat whose young one is wrapped up in a fold of the wing membrane.

ORDER : CARNIVORA

THE FLESH-EATERS

In this large and widely distributed order are comprised many species of animals which feed chiefly, but in a few cases not exclusively, upon flesh. They are the "beasts of prey," all of which in their general conformation and the structure of their teeth and claws denote special qualifications for capturing living animals and tearing and devouring flesh. In the previous orders, even the Monkey tribe, we have encountered creatures with a liking for animal food to give a relish to a vegetable diet ; but the Carnivores are frankly flesh-eaters, the lack of a sufficient supply rouses their fiercest passions, and for some of them complete abstinence means inconvenience, if not death itself.

FAMILY : FELIDÆ

THE CATS

The Cats are at the head of the Carnivora, and are practically as distinct an order as the monkeys and the bats. Pre-eminently carnivorous in their diet, and destructive in their mode of obtaining food, their bodily form is most exquisitely adapted to carry out the instincts which are implanted in their nature. They are vigorous in frame, without an atom of superfluous flesh ; bone, muscle, and sinew all subscribe to general agility, and particularly free and graceful motion. The slender limbs are well-knit and supple, and the under surfaces of the feet are padded with elastic cushions, which render the footfall noiseless when stealing upon their prey. The strong, sharply pointed and curved claws are retractile. When the animal is at rest, the upper tendons draw the claw backwards, so that it is lifted entirely from the ground, and the weight of the body rests only on the soft pads. But when the creature becomes excited, and thrusts out its paw for the purpose of striking a blow, or clutching at its prey, the upper tendons become relaxed, while the lower ones are tightened, and the claw is thrown boldly forward, sharp and ready for either use. The Cats are digitigrades, they walk upon their toes, which is an aid to swiftness, but the sharp retractile claws do not come in contact with the ground to blunt them, as well as to make a noise at each

step. The heel bones project considerably, which gives leverage to the limbs for leaping and bounding, by which method of progression the Cats are able to overtake swift animals before their slender limbs can get into full flight.

The teeth of the Cats are very distinctive; the incisors have sharp cutting edges, the molars are more or less pointed, and the canines are long, strong, and curved. The jaws are not capable of a grinding movement, they are only terrible shears. The canines double-skewer the wriggling prey, which is torn up and bolted in great snatches. The tongue is furnished with rough, horny projections directed backwards, which serve the very important purpose of a rasp for removing the last particle of flesh from the bones.

We have already learnt something of the dilatable eyes of nocturnal animals, but the eyes of the Cats are adapted for vision by either day or night; in the light the pupils narrow to mere slits, and in the darkness they open to admit every available ray of light. The sense of hearing is extremely acute, the sight is keen, and the power of smell remarkably developed; and the long whiskers possess an exquisite sense of feeling. The skins of all the Cat tribe are loose, which in combat renders it difficult for even sharp teeth to get a firm grip of them. The various peculiarities of structure that have been described are practically common to all the Cats, but in considering each species separately will be gleaned additional facts concerning these animals, whose elegance of form, sleekness of skin, and often beauty of colouring are only equalled by the crafty suspicion and bloodthirstiness that marks their daily life.

THE LION (*Felis leo*)

The Lion in different regions exhibits variations in size, colour, and even in character, but whether in Africa or Asia there is really only one species. Old-fashioned naturalists thought otherwise, and claimed that the black-maned and the yellow-maned animals were distinct species, but it is impossible to reconcile such a view with the fact that in the same litter there may be both black and yellow-maned cubs, just as human twins do not of necessity possess the same-coloured hair.

The best-known variety is the South and East African Lion, tawny yellow in colour, lighter on the under parts of the body, darker above. The ears are blackish, and the tip of the tail is decorated with a tuft of black hair; and no other member of the Cat tribe possesses a tufted tail. Even in the same region the general colour may vary from silvery grey to dull tawny or yellow; in any case the generally uniform colour of the coat is hardly distinguishable from the surrounding landscape even in broad daylight. Accomplished hunters declare that they have experienced difficulty in detecting the bodies of lions at twenty yards' distance, although they could hear the animals lapping water.



PLATE IV

Leopard
Lion

When fully grown the male Lion will measure nearly four feet in height at the shoulder, eleven feet in length, and may attain a weight of five hundred pounds. Its strength is more than in proportion, and there is no animal except the rhinoceros and the elephant that it cannot pull down. The thick, shaggy mane of long hair, which falls from the neck, shoulders, and part of the throat and chin, gives the full-grown Lion a regal appearance that has had much to do in gaining for it the title, 'King of Beasts.' In a wild state the adornment generally falls short of that which is attained by the show animals of menageries; but the captive rarely grows to the size and strength of the wild animal, with its limbs unshackled and its spirit unbroken. The lioness is smaller than her mate, but very



LION CUB

often the lack of a mane is the chief cause of the deceptive disparity; and very many of the males have only the semblance of a mane.

Like all the members of the cat tribe, the Lion is more or less naturally indolent, and even when aroused by the calls of hunger will not take more trouble than is necessary for the attainment of its end; and if it can strike down a small antelope it will not search for more difficult though larger game, such as a buffalo or a giraffe.

The Lion launches itself at its prey in a terribly swift bound, and usually effects its object in one of two ways: a bite at the throat tears the jugular vein, or one at the back of the neck behind the ears is equally effective; but quite often when it alights upon the shoulders of the quarry it breaks its neck by wrenching the head round with one of its fore-paws. In the swift attack there

may be a combination of both methods, but the crash of the victim's head upon the ground with the impact and weight of five hundred pounds upon it, brings the flight of even the biggest animals to a full stop. The Lion's next step is terribly drastic, for with one stroke of its paw the entrails are torn out, and such delicacies as the heart and liver are devoured, before commencing to gulp down huge lumps of meat. In a single night the greater part of a zebra will be eaten.

The roar of the Lion inspires every other animal with terror, and the reverberating thunders of its voice form a useful aid in obtaining food. If in its nocturnal wanderings it has met with no success, the huge carnivore places its mouth close to the earth and gives vent to terrific roars. The effect is to cause all kinds of creatures to leave their lairs in bewilderment and frantic terror, and in their desire to escape the threatened danger they rush heedlessly within reach of the lurking foe. On the outskirts of a settlement or a camp the Lion thus often causes stupid cattle and horses to break from their tethers and stampede towards the author of the panic, whom fires and dogs are keeping at a respectful distance.

Some writers persist in regarding the Lion as a cowardly, sneaking animal, which at its worst is no more formidable in combat than an enraged mastiff. Its attitude doubtless depends entirely upon circumstances, and the animal that one day is timid and skulking will, upon another occasion, be correspondingly ferocious and truculent. The lion-hunter has to pit cunning against cunning, and the least lack of caution at one moment, and dash at another, will spell disaster. Some animals, when chased, may be relied upon to act in a certain manner; but it is impossible to gauge what a Lion will do, and under no circumstances is it ever stricken by panic.

Livingstone once headed a party of natives with the idea of exterminating some Lions that were depleting the herds of cattle. The white man had fired an ineffective shot, when a Lion sprang out upon him, seized him by one shoulder, and brought him to the ground. Meanwhile a native schoolmaster was trying to shoot the brute at a distance of ten or fifteen yards. His flintlock musket missed fire in both barrels, upon which the angry Lion left Livingstone and took hold of the schoolmaster's thigh; and when another native tried to spear it, he found himself in the clutches of the Lion, which was munching his shoulder. Fortunately by that time the beast had received several bullets and fell down dead. Livingstone's arm contained eleven teeth wounds, and the bone was crushed to splinters, so that it was of little service ever afterwards. The missionary explorer attempted to describe his sensations while clutched by the Lion. He likened the feeling to that of a patient partially under chloroform, a half stupor in which there

was no fear, but a feeling of disinterested curiosity, concerning which part of him the Lion would eat first.

With the approach of age, and some infirmity of the frame, a Lion often becomes a man-eater. Unarmed man is weaker of limb, slower of foot, and less wary than any of the wild animals, and therefore is a victim that can be slain without much trouble. But Lions in their prime sometimes acquire a taste for human flesh ; and then the man-eater becomes a scourge, whose death is urgently necessary in the interests of the community.

When the Uganda railway was in course of construction, and the railhead had reached Tsavo, a hundred miles from the coast, a couple of man-eating Lions quickly accounted for thirty Hindu coolies, and still more native navvies. Men were snatched out of their huts at night, and when a thorn fence was erected for protection, a Lion cleared it, and with its shrieking victim in its mouth forced its way back through the useless barricade. Once one of the marauders was caught in a big wooden cage, but the enraged coolies blazed away so recklessly at it, that they blew away part of the door and the Lion escaped.

The railway workers were in a state of panic, and even when Colonel Patterson arrived upon the scene and bagged one of the brutes, the remaining one still terrorised over hundreds of men, who could not sleep for thinking who would be the next victim. One moonlight night the Colonel was on watch, and put a bullet into the Lion's chest, and as it bounded into cover another one took effect. When daylight came the wounded animal was tracked down. A bullet in the head led the Lion to charge, during which it received a second one in the hind legs, and a third in another part of the body. It then lay still, as if all were over, but it proved to have sufficient vitality for another murderous rush, in which one last bullet terminated its evil career. Surely it cannot be maintained that a Lion can put up no better fight than a mastiff.

With the increasing spread of the white man in various regions of Africa, and the driving further afield of the great herds of antelopes by civilisation generally, the Lion has become scarce where formerly it was numerous, especially in the south. It is doubtful if in any part of the continent a traveller would now in one day meet with nine troops of Lions such as Moffat, the missionary, saw in the early sixties. The Lions of Algeria, Somaliland, Mesopotamia, Persia, and India too much resemble the South African variety to call for detailed mention. In India the extermination of the Lion is gradually nearing possibility, thanks to the long occupation of the country by white men.

THE TIGER (*Felis tigris*)

The Tiger almost equals the Lion in size, competes with it in strength, and excels it in activity; while for elegance of form, grace of movement, and the beauty of its coat it is much more notable. A full-grown male Tiger attains a length of nine and a half feet, and a weight of about four hundred and fifty pounds, though exceptional animals exceed these dimensions, the largest known, shot north of the Himalaya, measuring thirteen and a half feet.

The coat of the Tiger presents a beautiful arrangement of markings and contrast of tints. Sundry transverse dark stripes are placed on the bright, tawny-yellow groundwork of the body and limbs; some of them are double, but the majority are single dark streaks. The underparts of the body, chest, and throat, and the tufts on each side of the face are almost white, and there the stripes become fainter, fading gradually into the light tint of the fur. The skin of the animal is loose almost to bagginess, and the fur is very thick and close.

The brilliant coat of a captive Tiger is very conspicuous, but in its native haunts it harmonises completely with the dry, dusky jungle grass, and even when crouching among low and scanty vegetation, the big animal may almost be trodden on without being seen. Its stealthy step is almost inaudible, and it draws in its breath and flattens its fur, which reduces its bulk to the smallest possible compass.

The Tiger's face is a terribly accurate index to the fierce passions that rage in its breast. The cruel yellow fangs are well shown in the animal's ferocious snarl, so admirably depicted in the frontispiece, which, however, cannot do justice to the baleful eyes, which at one moment are yellow, changing quickly almost to green, or a deep neutral tint.

In India the Tiger remains more than fairly plentiful, for not only do the dense forest and swamp regions provide largely impenetrable cover, but some of the religious sects view the animal as sacred, and will not permit it to be killed, unless it is a man-eater which threatens to depopulate a district.

In seeking its prey the Tiger creeps stealthily towards the object, availing itself of every cover, until it can spring upon its destined victim. The man-eater selects spots by the side of moderately frequented roads, from which it will leap out, cunningly selecting women and children in preference to men, who are usually armed. When the Tiger has killed a large animal, such as an ox, it tears open the throat, and greedily laps the hot stream that pours from the wound. Dragging the body into a place of concealment, it begins at the hinder quarters and eats gradually towards the head, only leaving its meal in order to obtain a draught of water

from a neighbouring stream ; but never completing the gluttonous repast until it is unable to take another mouthful. Gorged with flesh, skin, and even bones, the Tiger relapses into a semi-torpid state which sometimes lasts for two or three days, by which time it is ready for another feast.

A Tiger will often make fearful inroads upon herds of cattle. The marauder always returns to any undevoured remains of its last victim, into which in the meantime a native cattle raiser will sometimes insert poison with very telling effect. If, instead, he lie



SUMATRAN TIGER

in wait to shoot the animal, care must be taken to kill it outright, for if only injured the Tiger learns caution from the experience. In such a case the wily creature will not again return to a carcase, and sometimes will kill as many as three oxen in a night simply to regale itself on their blood.

Tiger-hunting on foot is little better than suicide. Sometimes hunters station themselves in trees, near the foot of which a decoy animal is tethered to tempt the Tiger within gunshot. For organised hunts elephants are always requisitioned to beat the grass and reeds, which are often ten feet in height, and the sportsmen take their stand in howdahs, high up on the elephants' backs. Slowly through the cover sweeps the long line of elephants, whose interest

in the chase is second only to that of their masters. Often an elephant will scent a Tiger long before it is visible, and will give warning to the party by striking its trunk sharply against its knee. The Tiger evinces the greatest cunning to avoid offering a mark, but when once it bounds out of cover, modern sporting rifles with expanding bullets afford it only a remote chance of escape.

A 'pad' elephant is often badly mauled on the trunk, for when the chase is at its height the enraged Tiger will turn in its tracks and make a desperate onslaught upon the huge beater. Under the circumstances the hunter in the howdah cannot get an effective shot, even at a distance of only a few feet; and meanwhile the wounded elephant is trumpeting wildly, while it endeavours to give the madly clawing beast a kick that will break its ribs, or to kneel upon it with equally ill effect.

Often a wounded Tiger manages to take cover in a patch of jungle, and fails to leave a track of blood to lead the shikaries to its retreat, for the simple reason that the animal's baggy skin may prevent a bullet wound shedding blood. When a bullet passes into the body, that particular portion of the skin may be out of its usual position, and when it slips back again to its proper place the bullet hole may not coincide with the wound from which the external outflow of blood is prevented.

The annual death-roll in India from the attacks of Tigers is constantly decreasing, for the notification of a man-eater is sure to attract sportsmen keen upon its destruction. Who holds the record for the number of Tigers that have fallen to his rifle it is impossible to tell, but one Indian Woods and Forests official in the course of his twenty-five years' service killed no less than a hundred and thirty. This is a remarkable record, especially considering that he encountered all the brutes while he was on foot in the course of his ordinary duty in the forest regions of India and Burmah.

The delta of the Ganges is the chief home of the Bengal Tiger, but there are different varieties throughout Malaysia, Further India and China. It is a mistake to suppose that the animal only inhabits purely tropical regions; it extends even into Central Asia, where its coat is quite woolly to enable it to withstand severe cold. Albino Tigers are not unknown, the colour usually being a creamy white with the characteristic stripes so very faintly marked as to be visible only in certain lights.

THE LEOPARD (*Felis pardus*)

The Leopard, or Panther, is found in Africa from the Mediterranean almost to Capetown, and everywhere in Southern Asia; and always it bears the worst of characters, for it possesses a crafty brain, as well as an agile body and sharp teeth and claws to execute its purpose.

A full-grown Leopard stands about two and a half feet high at the shoulder, is seven feet in extreme length, and weighs about one hundred and fifty pounds. Very many Leopards do not exceed five feet in length, but as I write, I have before me a photograph of a dead brute that was an "eight-footer," and of proportional build. In the beautiful markings of its fur, and its lithesome grace, the Leopard challenges comparison with the tiger. The ground colour varies from nearly white to jet black, but the rule is reddish yellow, marked from head to foot and to the tip of the tail with 'rosettes,' black spots with a paler centre; in the case of the darker animals the spots are very indistinct.

In South Africa the Boers call the true Leopard the '*tijger*,' while, strangely enough, they give the name 'luipard' to the cheetah. In India the animal is often called the 'Tree Tiger,' which is less of a misnomer, since it is an adept at climbing trees; but it is an accomplishment which neither the lion nor tiger possesses.

Although a lion was killed only a few miles out of Johannesburg within the last fifteen years, a repetition of such a kill is very improbable; but the Leopard is to be met with in any broken country where it can find lurking-places with water at hand, and food for foraging. Its natural diet consists of small antelopes, baboons, wild pigs, any small mammal and game-birds. In settled districts the Leopard plays havoc with calves, sheep, and goats, and when pressed by hunger does not hesitate to attack partly grown oxen and colts. Being almost strictly a nocturnal animal the farmer's chief remedy is poison, and rewards are offered for each noxious animal accounted for.

The Leopard often deposits its surplus food in the branches of a tree, and no matter how advanced putrefaction may be, it will not object to dine off the foul offal; and, consequently, a hunter who suffers from the bite of a Leopard is in no small danger of blood-poisoning. Next to a baboon, the spotted carnivore perhaps prefers a dog to any other prey, and it will run unusual risks to satisfy its liking.

Though the Leopard is smaller than the lion or tiger, it is to be feared none the less on that account. When wounded it will not attempt to slink off, but will come straight at its foe, a whirlwind of claws; or, on the other hand, it will lie up in grass or reeds, or on the branch of a tree, from which it will spring to wreak a terrible revenge. At close quarters it is an open question whether a hunter is not in greater danger than from a tiger, for the Leopard not only bites fiercely, but uses all its claws, especially the hinder ones, with cruel effect.

The Ounce, or Snow Leopard (*Felis uncia*), has its home in Central Asia. Its long white fur is overlaid with a delicate grey,

upon which are marked irregular rosettes of black. The coat is not only thicker than that of the ordinary leopard, but it is decidedly woolly, as it needs be, considering that the animal, even in winter, makes its home at a height of 6000 feet above sea-level. The Ounce is but rarely seen. In 1891 the Zoological Society purchased an animal supposed to have been captured in Tibet, near the northern boundary of Bhutan, but it lived only for a short time.

THE JAGUAR (*Felis onca*)

The three felines already described belong wholly to Africa and Asia, but in the New World the Cat family has beautiful and graceful representatives, of which the Jaguar is the largest and finest example. Though exceeding the leopard in size, the Jaguar falls short of the proportions of the tiger. Across its breast are two or three bold black streaks, while the rich, tan-coloured fur elsewhere, except a medial line of white on the underparts, is thickly studded with dark spots. They are larger in proportion than the spots of the leopard, and each rosette has a small mark in the centre.



JAGUAR

The Jaguar ranges the dense forests of Central and South America, where its prey includes many creatures, from horses down to lizards, fish, and even insects. The fact that the agile New World monkeys easily fall victims to the Jaguar is a testimony to the carnivore's quickness; but it will also scoop fish out of the water, if they come within reach of the deft, swift paws.

The body of the Jaguar is lithe, and yet sufficiently robust to exert enormous strength. On some of the South American plains are troops of wild horses, where the huge cat does more than

snatch up a heedless foal. It has been seen to swim across a wide river, to strike down a good-sized horse, to swim to the opposite bank with its prey, and then to drag it out of the water and carry it into a wood, where it settled down to its repast. It is said that on land the Jaguar overcomes the alligator, but that the reptile wins the day if it can only reach its native element.

Though the Jaguar seldom attacks man, it wages such vicious war on horses, cattle, sheep, and pigs, that the settlers and stock-raisers seek every opportunity of making its acquaintance, as soon as its presence in their district is announced. Humboldt asserted that there were four thousand Jaguars killed every year, and two thousand skins exported from Buenos Ayres alone. But that was ninety years ago, and meantime the white man has done for the settled regions of the New World what he has accomplished for some of those of the Old. It is interesting to speculate what depredations tigers in India, and lions and leopards in South Africa, would be committing to-day but for the fact that in these territories the white man has made unceasing war upon the carnivores.

THE PUMA (*Felis concolor*)

The Puma of America is known by a variety of names ; it is called the American Lion because of its uniform tawny colour ; the name ' Panther ' fits the creature's leopard-like habits, although Anglo-Americans have corrupted the word into ' Painter ' ; and as a result of mistaken identity it receives several other names, of which ' Cougar ' is a rendering of Carajou, which happens to be an entirely different animal.

The range of the Puma is very extensive, from British Columbia on the Pacific and the New England States on the Atlantic, almost as far south as Cape Horn ; in winter, in the northern regions, the animal's cinnamon colour takes on a greyish tinge, but the coat does not lengthen as does the tiger's in Central Asia.

The smallness of its head gives the Puma a less powerful appearance than is really the case ; and although its body is only about four feet in length it holds its own with any of the Cats for boldness and fierceness, for it will snatch still living prey from the jaguar, and will render an excellent account of itself against the grizzly bear.

The animal is not particularly dreaded by the inhabitants of the regions where the Puma makes its home ; and, in fact, Mr. Hudson asserts that it is perfectly safe for children to sleep out in the open in La Plata, the Puma being but a big kitten at heart. Nevertheless, the average ' Painter ' is a typically ferocious cat, and it is always a pestilent neighbour to the farmer ; fifty sheep have fallen victims to one Puma in a night, which is as unenviable a record as any beast could desire. In the wilds the animal cannot forage with such ease, and, like the jaguar, it lives largely on such animals as the peccary

and capybara, birds such as the rhea, and any small quadruped, as small as a mouse, that comes its way.

Just as the leopard has a *penchant* for dogs, so the Puma sets its desires upon horseflesh, and thus the herds of wild horses lose a frightful percentage of their colts. The Gauchos, the hunters of



PUMA

the Pampas, make very short work of the hated carnivore. They often lasso it and then gallop off with the bewildered captive, bumping out its life at the end of the leathern cord. At other times the hunters resort to the *bolos*, metal balls or stones fastened together with a leathern thong, which they skilfully throw to entangle the Puma's feet ; and when it falls to the ground the end is effected by a blow from a heavy weapon.

THE SMALLER CATS

There are numerous more or less beautiful animals that are popularly called Tiger or Leopard Cats. In most cases their fur is diversified with brilliant contrasts of a dark spot, streak, or dash, upon a lighter ground ; their actions are marked by easy grace, and they seldom fail to exhibit the bloodthirsty traits of their larger brethren.

The Ocelot (*Felis pardalis*) is plentiful in the tropical regions of South America. From its nose to the tip of its tail it is about four feet in length, with an average height of eighteen inches. The light, greyish-fawn fur is richly marked with broken bands of

deeper fawn edged with black. On the head, neck, and inside of the limbs, the bands are broken up into black spots and dashes ;



OCELOT

the ears are black except for a conspicuous white spot upon the back and near the base of the ear. Ocelot skins are used in the manufacture of various fancy articles of dress and luxury.

In a wild state the Ocelot is a nasty opponent if wounded or irritated for any cause ; in captivity the temperament varies considerably. Some animals exhibit nothing but a fierce and surly attitude, and a footstep near the cage draws a savage growl ; and as soon as a visitor shows himself the Ocelot will spit angrily, striking sharp, quick blows with its paws. Yet another captive may be as tractable as a domestic cat, and will rub itself against the bars to be stroked and petted, at which it evinces considerable pleasure.

The Serval (*F. serval*) is an inhabitant of Africa in regions as widely separated as Algeria and Cape Colony, where the colonists call it the Bush Cat. It is about two feet long in the body. The ground colour of the creature's



SERVAL

fur is a golden tint, upon which are placed dark spots, some of which run into each other to form stripes. The tail is shorter and more puffy than that of the preceding animal, and is ringed with black. It preys upon small animals and birds, but is strong enough to hang on to a young antelope until it falls from weakness. Though the Serval is vicious to a degree when hunting for food, it is at other times quite sportive in disposition.

The Fishing Cat (*F. viverrina*) of India, though it ranges as far as Southern China and the Malay Peninsula, is of rather irregular distribution. Though only thirty inches in length, exclusive of the tail, it is as fierce a little beast as it is possible to find in the whole of the *Felidæ*. It is undoubtedly fond of fish, but it will also kill a young calf, sheep, or a dog; and it has been known to snatch up a Hindu baby and carry it off to devour it. What the creature lacks in size it makes up in unbridled ferocity, of which let the following serve for example. A freshly captured male Fishing Cat was caged next to a tame female leopard; it broke down the partition between the two cages and fiercely attacked the animal which was twice its own size. The leopard fought desperately, but it was overpowered and destroyed.

The Wild Cat (*F. catus*) of Europe, if only for its shorter head, suggests an approach to the domestic type with which everybody is familiar. It is doubtful if the Wild Cat now exists in England,



WILD CAT

and, never having made its home in Ireland, its last fortress is among the northern Scottish hills. Even there it is often scarce, and the time is within measurable distance when it will be as extinct as the wolf; yet recently, within the space of only three months, a

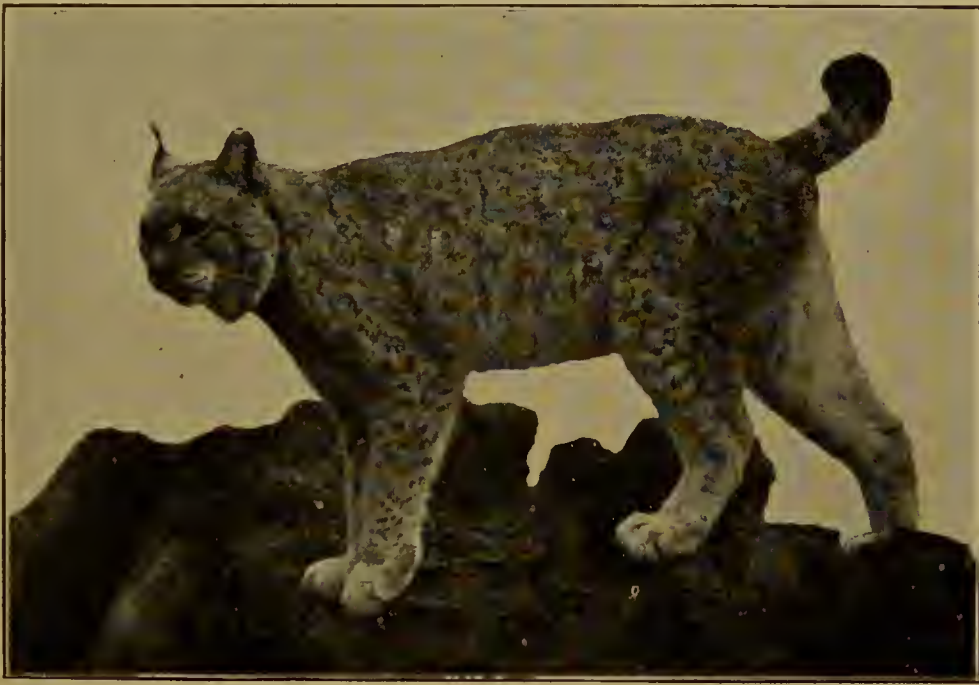
gamekeeper killed no less than fourteen Wild Cats in one northern glen. The colour of the Wild Cat is a yellowish or sandy grey, with dark streaks drawn over the body and limbs in a very tigrine manner; the tail is barely half the length of the head and body. It takes up its residence in rocky and wooded country, selecting for its home a cleft of rock, or the hollow of an old tree, from which it issues on marauding excursions. The discovery of

headless grouse speedily rouses the ire of the gamekeepers, and vigorous steps are taken to shoot or trap the culprit. In its marked liking for the heads of its victims the animal exhibits the same taste as many of the larger cats.

We have no space to devote to the Domestic Cat, of which there are so many varieties, with self-coloured coats of almost every shade and variegated coverings, many of which are exceedingly pretty. Sometimes pussy takes to a wild life and becomes a terrible enemy to rabbits, game, and poultry; and the second and third generations of such animals are little better than their real wild relatives, from whom, however, they may always be distinguished by the longer and less bushy tail, standing lower on the legs in proportion to the size, and a less coarse look about the head.

THE LYNXES

The Lynxes, of which there are various species in the Old and New Worlds, are distinguished by their longer legs, shorter tail, and erect, pointed ears, decorated with a tuft of hair of varying dimensions. The European Lynx (*Felis lynx*) is found in the northern and central regions of both Europe and Asia. Its body and



EUROPEAN LYNX

head are not more than three feet in length, and the tail does not exceed seven or eight inches. Normally the colour of the animal is a rather dark grey washed with red, forming the groundwork of various dark patches, that take an oval or oblong shape on the body, and more or less a circular one upon the limbs. In the winter

the fur becomes fuller and more grizzled. It inhabits rocky, wooded districts, where it preys upon small mammals and birds ; but in the vicinity of settled regions it is a remorseless enemy of sheep, of which animals one Lynx has been known to destroy forty in a night. The Canadian Lynx (*F. Canadensis*) dines upon the hare for choice. It is hunted for its fur, and when it is captured a blow with only a slight stick is sufficient to kill the creature, whereas the Cats, as a rule, are very tenacious of life.

†The Caracal (*F. caracal*) is the most handsomely clothed of the Lynx family, and its black ears are a very distinctive mark. Its colour is pale brown, warmed with a tinge of red, but varying



CARACAL

in different individuals. The under parts, which are paler in colour, are slightly besprinkled with spots, which range from nearly black to reddish chestnut. It is a surly, ferocious, and malevolent animal, and in captivity is always ready for a snarl and a bite, very rarely being amenable to the kindness of its keeper.

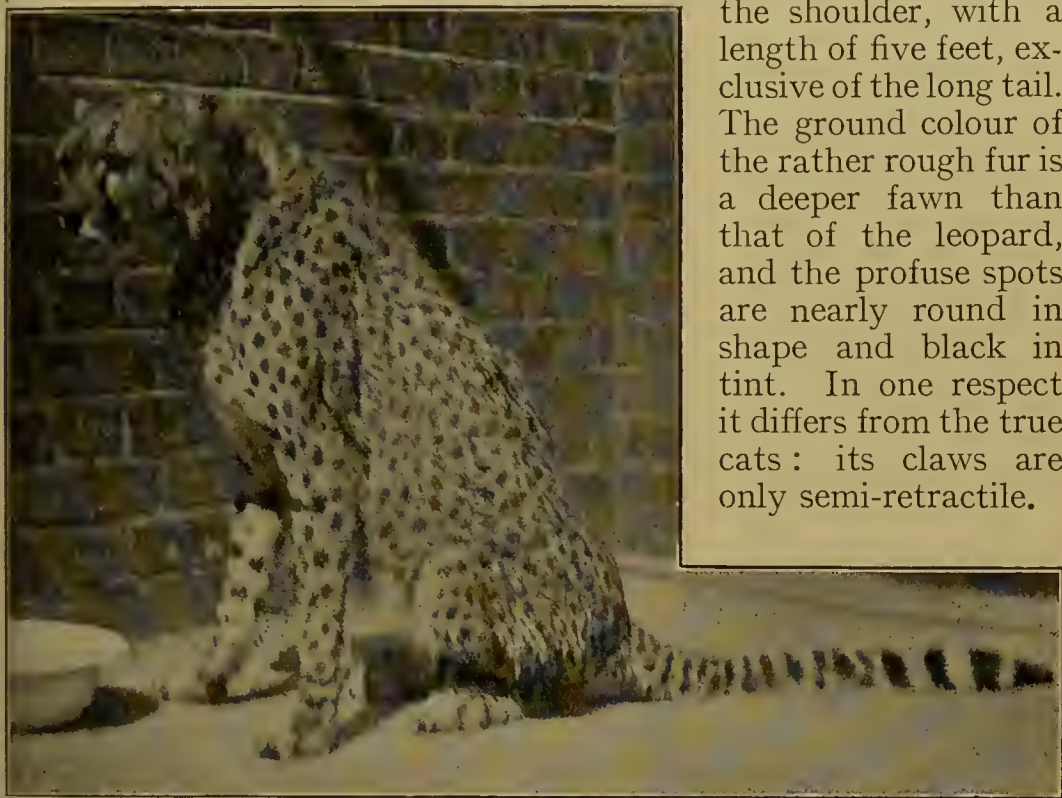
The Caracal is active and muscular, although it is considerably less in size than the common lynx. It is not particularly fleet of foot, nor very delicate of scent, like most of the markedly predaceous cats ; but it displays great craft in the chase of its prey, and makes the most surprising leaps with an accuracy that is really marvellous. Like the lynx proper, it is thoroughly at home among the branches of trees, and a creature seeking refuge there finds it little better than a trap.

The head-quarters of the Caracal are Arabia, Egypt, South Africa, Persia, and the greater part of India. In the East the animal is trained to render assistance in hunting. It will lie in a place of concealment and spring out on the unsuspecting quarry, after which it will lie motionless until its master arrives to remove the slaughtered victim.

THE CHEETAH (*Cynælurus jubatus*)

The Cheetah, or Hunting Leopard, is an elegantly formed and beautifully marked creature, inhabiting South-Western Asia and many parts of India ; while the same species is found in East and South Africa. The animal very much resembles a long and slender-limbed leopard, with a head small in proportion to its height. It

is three feet high at the shoulder, with a length of five feet, exclusive of the long tail. The ground colour of the rather rough fur is a deeper fawn than that of the leopard, and the profuse spots are nearly round in shape and black in tint. In one respect it differs from the true cats : its claws are only semi-retractile.



CHEETAH

In the East, particularly India, the Cheetah is regularly trained for the chase of deer and antelopes. The hunters bandage the creature's eyes until the moment is ripe for calling its natural powers into play. Employing all its inborn artifices, the Cheetah sets out in pursuit of the game, and then with one powerful leap strikes down the selected animal. The keepers hasten to the spot and distract the attention of their ally from its prey by giving it a ladleful of the hot blood, or offering it the head and neck of a fowl, of which it is extremely fond. The quadrupedal assistant is then hooded afresh until more game is in sight. In the first instance the animal is rendered tame and submissive by a course of starvation, during which it is forcibly kept awake. In the case of a true cat such a process would render the animal doubly ferocious, whereas the Cheetah becomes amenable to discipline, and makes itself exceedingly useful.

FAMILY: VIVERRIDÆ
THE CIVETS

The Civets gain their name on account of the thick, buttery, and peculiarly scented substance which is secreted in a double pouch under the abdomen, close to the root of the tail. At one time civet perfume was valuable for its medicinal qualities, but nowadays its chief use is in the manufacture of various perfumes. Considering that the substance realises as much as forty shillings an ounce, the animal is too valuable to be killed, and is largely kept in a state of captivity, so as to afford a continual supply of the odoriferous material. Animals belonging to this group are quick and active in movement, and furnished with sharp teeth, and, consequently, are not pleasant creatures to handle when imbued with any feeling of resentment. When the time arrives to rob an animal of the perfume, it is placed in a cage too narrow to allow of turning round, and while it is in this helpless condition the secretion is scraped from its pouch with a bone or a wooden spoon. The interior of each sac-like gland is large enough to hold a large almond, and when the animal is in a natural state the perfumed substance falls from the pouch in pieces about the size of a Spanish nut.

The Common Civet (*Viverra civetta*) is a weasel-like animal, from two to three feet in length, in addition to the fairly long tail. Its home is in tropical Africa, especially Abyssinia. It is handsomely



COMMON CIVET

clothed in yellowish-grey fur with bold spots of black and white; the tail is marked with dark bands. The animal is popularly and wrongly called the Civet 'Cat,' for its claws are only partially retractile, its canine teeth are not so pronounced, and its jaws are not limited to shear-like action. The Civet seldom ventures out of hiding in daylight, but under cover of darkness it will approach

quite close to habitations, at which time it is advisable to have all poultry safely housed. The animal preys upon small mammals, birds, eggs, reptiles, frogs, and insects, varied with roots and fruits.

The range of the Indian Civet (*V. civetta*) extends to Southern China and the islands of Malaysia. In general tint it is paler, and the spots are less distinctly outlined than in its African cousin. In the East Indies the Dutch colonists formerly kept a great number of these animals for the sake of the civet perfume. In captivity it is a tractable creature, and in many Eastern regions it makes itself as useful as the domestic cat; but there are several other species that bear confinement very impatiently, and under no circumstances do they lose their naturally ferocious character.

Closely allied to the foregoing animals is the Genet, another native of Africa, north of the Sahara, but also extending through Syria into portions of the south of Europe. The Blotched Genet

(*Genetta tigrina*) will serve as a type of the whole genus. The fur is mainly grey with a shading of yellow, upon which dark brown patches are lavishly scattered. The feet are furnished with retractile claws, and thus its talons give effective-



GENET

ness to a blow with the paw, and make for ease and rapidity in climbing trees. The Genet is easily domesticated, and renders useful service in waging war upon rats and mice. It is but about twenty inches in length, and five inches high at the shoulder, and in search of its prey the very weasel-like body can be insinuated into narrow crevices. The animal possesses a musk-secreting apparatus, but it is neither so large, nor does it yield so powerfully smelling a substance as the civet.

Mention might be made of various more or less similar animals, to many of which the name palm-civet, tree-cat, or toddy-cat is indifferently applied. Though each species has some distinction in structure or colouring, all are nocturnal and arboreal, and live on a mixture of animal and vegetable substances. An entirely different member of the family is the Cynogale (*Cynogale bennetti*) of the Malay Peninsula and neighbouring islands. Only thirty inches in length from its nose to the tip of its shortish tail, the animal resembles a small otter. It is a facile climber, but its partially webbed feet also fit it for a semi-aquatic life, and thus it adds fish, crabs, etc. to the general diet of the family.

THE MUNGOOSES

This group consists of a numerous race of small animals which prey upon many creatures that plague man in tropical countries ; but though they are capital vermin killers care has to be taken to prevent them turning their destructive attention to poultry, or otherwise their usefulness in one direction is speedily discounted in another.

The Egyptian Mongoose (*Herpestes ichneumon*) is a species common to North Africa, Asia Minor, and the portions of Spain that border on the Mediterranean. The word 'ichneumon' means a 'tracker,' and it was formerly applied to this animal, instead of Mongoose, which is the Indian native name for a different species. The Common Mongoose, or Pharaoh's Rat, plays a most useful part in Egypt, where it is the crocodile's greatest enemy. With its sharply pointed snout, narrow body, and short legs, it is but a brownish-grey animal about three feet in length, nearly half of



INDIAN MUNGOOSE

which is tail ; and one would suppose that a crocodile would welcome a dozen such creatures for a meal. The Mongoose works against the big reptile only indirectly, for it feeds largely upon its eggs. A crocodile's egg is markedly small, and the 'tracker,' being blessed with a very workmanlike appetite, puts an end to many prospective reptiles. The Mongoose, however, is very catholic in its tastes, and welcomes snakes, rats, lizards, mice, or birds. For its useful qualities the ancient Egyptians tamed the Ichneumon, and allowed it the free range of their houses, and thus it is often depicted on their stone carvings.

The Indian Mongoose (*H. mungo*), a trifle smaller than the foregoing, is a great favourite in snake-ridden Hindostan. Rats and mice are easy game to the pepper-and-salt-coated little animal, but it is the cobra that raises its battle instinct to the full. Every hair on the lithe, well-haired body stands out until the Mongoose appears to be double its usual size, its small red eyes glitter, and its whole bearing is full of eagerness and ferocity, as it dances round the reptile, that, with head erected, is waiting an opportunity to strike. Time after time the darting fangs of the serpent appear to hit its foe, but probably the set-up hair causes the reptile to strike short of the body. In any case, the Mongoose keeps up its dance until, in a flash, it pins the cobra by the back of its head; there is a crunch, and the victor commences a fairly earned meal.

Forty years ago a plague of rats threatened to ruin the sugar plantations of Jamaica. A dozen Mongooses were turned loose on the island, and when their numbers had increased to about fifty in the following spring, the extermination of the pest was commenced in real earnest. The planters, however, did not find the result an altogether undiluted joy, for not only did the hen-roosts suffer considerably, but Indian ticks were introduced into the island.

There are quite a score of species of Mongoose differing chiefly in size; in form and habit they are generally alike, and all possess scent glands of an inferior kind.

FAMILY: PROTELIDÆ

THE AARD WOLF (*Proteles cristatus*)

The Aard Wolf of South Africa appears to form an intermediate link between the civets and the hyænas. Externally it much resembles the hyæna, for in addition to the sloping back and weak hind legs, the rough, coarse fur is rather indefinitely striped. It is, however, a smaller animal, only about three and a half feet in length, including



AARD WOLF

the rather long, bushy tail. The claws of the fore-feet are strong, and are essentially diggers. The animal is a first-class excavator, and digs for itself a deep burrow, in which to lie up during the day ; and hence the popular title, Earth Wolf. Three or four of these animals will construct burrows which terminate in a common chamber, though each animal enters the den by its own particular burrow. Like the hyæna, the Aard Wolf eats carrion, to which it adds small animals ; but it does not disdain insects, of which, probably, white ants are those most preferred, the animal's powerful claws easily making holes in the stoutly built ant hills.

FAMILY : HYÆNIDÆ

THE HYÆNAS

The Hyænas bring us to a group of animals in marked contrast to those lithe creatures, the cats and civets ; yet, however repulsive in form and disgusting in habit, they perform a very useful office in the regions in which they live. They are the scavengers of certain thinly populated lands, clearing away decaying carcasses, which otherwise would poison the air. In our own country the dead bodies of animals of any considerable size are not allowed to cumber the ground, if only because even dry bones are turned to economic account ; but in the semi-civilised countries of Africa and Asia the Hyæna is the very saviour of health, swallowing every kind of putrid animal matter, and splintering even the thigh bones of an ox between its massive jaws and specially constructed teeth, in which even some of the molars have three cutting edges.

Unfortunately the Hyæna does not restrict itself to what may be termed its legitimate business in Nature's scheme. Where the animals become too numerous to find sufficient carrion for nourishing their mangy bodies, they harass the flocks and herds, and thus live at the expense of the community. No Hyæna will attack an ox directly, but it will spring up just under the bovine's nose, in order to startle it and set it running. Cattle in flight are always attacked and destroyed ; but if the prospective prey turn, the Hyæna will not develop its attack ; it will not even assail a knee-haltered horse. This characteristic of the beast is extremely aggravating to the stock-raiser, who is often robbed of a fine animal, while a sick or maimed one, that cannot run, remains undisturbed.

THE STRIPED HYÆNA (*Hyæna striata*)

Inhabiting Northern Africa generally, Asia Minor and India, the Striped Hyæna is about five feet long, including the shortish tail. In colour it is a dirty grey, the hair along the middle of the back being longer and more bristly than on the flanks and limbs,

which are diversified with blackish stripes. In a young animal the stripes are more pronounced than in an old one. The claws are blunted and not retractile, but the creature has a thorn-studded tongue like that of the feline groups. The front part of the body is much more developed than the hind-quarters, which gives it a shuffling, slinking gait. This appearance is in strict keeping with its character, for, notwithstanding its enormously strong head and neck, and its tremendous fangs, it will boldly face no enemy until it is cornered, when, in sheer desperation, it will resolutely turn upon its opponent.

The Striped Hyæna is a nocturnal and rather solitary animal, rarely prowling about in more than couples. It haunts villages, and enters even into unlighted towns in search of the offal, which is thrown into the streets regardless of sanitation. Cemeteries attract the revolting creature, which will rob a freshly filled, shallow grave of its contents ; but with its thoughts bent even upon the most ghoulish task, it readily turns to living prey if opportunity offer, and the ass in particular is viewed as a special tit-bit.

THE SPOTTED HYÆNA (*Hyæna crocuta*)

The Spotted Hyæna is an African animal roaming many regions, from Senegal across the continent to Abyssinia, and as far south as Natal. It is a more dangerous animal than the northern species ;

it is a foot longer, more massively built, and decidedly more aggressive.

The colour of its fur is yellowish brown and, instead of stripes, is marked with irregular spots or blotches. The animal is often called the 'Laughing Hyæna,' because of the hysterical, maniacal, mirthless laugh which it utters to the accompaniment of frantic gestures of body and limbs. This gaunt animal combines in packs, and there is



SPOTTED HYÆNA

nothing that comes amiss to its voracious appetite, from putrid refuse to children snatched out of their mothers' arms. In one night sheep-folds and cattle-pens suffer more mischief than can be remedied in years; but it is doubtful if all Hyænas do not prefer tainted flesh to that which is freshly killed.

When Messrs. Grogan and Sharp made their memorable journey afoot from the Cape to Cairo, in 1898, they were roused one night by a Hyæna which paid the camp a visit, and was drinking the soapy water that had been left in their india-rubber bath. The intruder was driven away, but he returned a little later, and "bolted with the bath, and before they could make him drop it had mauled it to such an extent that it was of no further use."

The Brown Hyæna (*H. brunnea*) of the coast regions of South Africa has its legs very definitely striped. It is not so well known as either of the preceding animals, whose worst traits it does not fail to share.

FAMILY: CANIDÆ

THE DOG TRIBE

The Dog Tribe embraces the wild and domesticated dogs, wolf, jackal, and fox. The chief external characteristics are a long, strong, and muscular body, which lacks the flexibility of the cats, an elongated muzzle, and non-retractile claws; on account of which last, a dog attacks with its teeth without a preliminary blow with its paw. The pupil of the eyes is round instead of elongated, except only in the case of the fox, which has a dilatable pupil. The dogs are digitigrades, and their senses of sight, smell, and hearing are developed to the acutest extent. Although, individually, many of the tribe are comparatively small, they are exceedingly gregarious, and their habit of hunting in packs often makes them far more dangerous than the larger, single-hunting cats.

THE WOLVES

In history, fiction, poetry, or nursery fable, the Wolf bears an unenviable reputation as a fierce and dangerous beast of prey, to be destroyed upon all possible occasions. There are several species, each containing more or less varieties, but often in a single litter the young ones display marked differences from their parents in form and colour. In the northern portions of either hemisphere there are few regions where these voracious animals are not found; and often they seem to be able to pick up a living where other predaceous animals would be unable to exist.

THE EUROPEAN WOLF (*Canis lupus*)

The Common, or European, Wolf is generally grey in colour, slightly tinted with fawn, but the animals of the north are usually lighter than those of the south; and it is practically the same

species that ranges over all Asia, except the south, Africa north of the Sahara, as well as North America. Some naturalists prefer to regard the last-named as a distinct species, because of its generally darker appearance, but the Wolves of Spain, for example, have even a more marked tendency towards black. The animal stands about two feet high at the shoulder, and sometimes attains a length of six feet from its nose to the tip of its tail, though the average is a couple of feet less.

The Wolf is nearly always hungry and, hunting in packs, dares much to gain its prey, not hesitating to attack such powerful animals as the buffalo, elk, or wild horse. Sometimes it will go as far as to tackle a bear, which lays many of its foes low before it is



YOUNG WOLVES AND FOSTER-MOTHER

overcome by weight of numbers. A Wolf will eat almost anything that walks or crawls, from human beings down to insects. It is, too, a confirmed cannibal, and a weak, sick, or wounded animal is certain to be devoured by its companions. A pack engaged in the chase, with a long, slouching gallop, wears out any creature on four legs, which is fetched down with rapidly delivered, sharply snapping bites. Wolves in a pack display more intelligence than is found in any of the cats, which, fortunately, do not work in concert, not even to the extent of a family party, although a male and female will sometimes make a joint attack; but Wolves will cunningly stalk their prey, and form an ever-narrowing cordon round it to cut off all hopes of escape.

Bold as the Wolf is under ordinary circumstances, there is no more suspicious animal in existence, and the near proximity of anything to which its eyes, nose, or ears are unaccustomed, reduces

it to something like terror. Telegraph posts and wires the creature views as a trap, and consequently gives them a wide berth. This peculiar caution on the part of the Wolf often serves defenceless persons in good stead ; a trailing rope or the exhibition of any strange article will keep a pack at a sufficiently safe distance until its harmlessness has been proved. There are many records of persons in vehicles being saved by the cannibalistic tendencies of a pursuing pack. When the gaunt pursuers are close enough to be dangerous, the judicious shooting of one animal will bring about a pause in the chase, while the ravenous beasts devour their unfortunate companion. This manœuvre, repeated at intervals, has often allowed a flying vehicle to reach a place of safety.

The last British Wolf was killed in 1680, thanks to our insular situation preventing the animals being replenished from outside regions. Any country on the Continent is less fortunately placed, but there are not nearly so many wolves in Europe as was formerly the case. Yet in Portugal, in June, 1909, Wolves, driven by hunger, descended from the mountains, destroyed a large number of farm stock, devoured ten persons, and prowled round the gates of the town of Torsas at night. Four travellers ventured to leave the town in a carriage, and were chased by several packs of Wolves that issued from a forest, and it was only owing to the speed of two magnificent Arab thoroughbreds, and the liberal use of their revolvers, that the travellers were able to reach, not their destination, but the place from which they started. Every year similar incidents occur in different parts of the Continent, especially in the wilder regions of Russia. Wolves, reduced to starvation, enter the villages, and though fewer people are killed than in olden times, numberless persons are bitten. Rabies is very common among Wolves, and consequently their victims are in danger of their lives, even from slight wounds ; and not a few sufferers are sent to the Pasteur Institute in Paris to be treated for the prevention of hydrophobia. The hunting of the Wolf is a systematic Russian winter sport in which the Borzoi hound renders good service. This huge white dog, weighing as much as a hundred pounds, is now often seen in England.

The Indian Wolf (*C. pallipes*) is smaller in size and is less gregarious ; but a couple of them will attack a man, and they contrive to carry off many Hindu babies. It is only in keeping with Oriental superstition that the natives should believe that the little victims are sometimes suckled by the Wolves instead of being eaten.

THE PRAIRIE WOLF (*Canis latrans*)

The Coyote, or Prairie Wolf, of the United States and Southern Canada is neither so large nor so ferocious as the Common Wolf ; but it has no mercy on any small animals, and is very destructive among sheep if opportunity offer. In the old days packs of



PLATE V
Striped Hyæna
Black-backed Jackal
Wolf

Coyotes held on to the rear of the herds of bison, marking out for destruction the young, or weak and sickly animals. When any prey is secured there is a scuffle in which there is little visible except a cloud of dust and hair, and a mass of whisking tails. Before



PRAIRIE WOLF

Canada was so extensively settled the Wolves always followed the prairie caravans, whereas they now search the transatlantic railway tracks for the scraps thrown from the dining-cars ; they will also attach themselves to hunting parties, keeping at a respectful distance until they can secure the remains of any slaughtered animal not required by the sportsmen.

THE JACKALS

THE INDIAN JACKAL (*Canis aureus*)

In the East the Jackal is the most numerous of the wild canines, the common, or Indian species, being widely spread throughout Western Asia, India, and Ceylon ; and in Eastern Europe and Northern Africa any differences in type are so slight as to be scarcely worth mention. The Indian Jackal, which attains a length of two and a half feet without the tail, is clothed chiefly in grey, with a yellowish tint, as indicated in the title, 'aureus,' or golden ; but the Jackals of any region vary considerably, very often being mottled black, grey, and yellow on the upper parts, and a lighter shade beneath. Nocturnal in habit, the animal does not often expose itself to notice, but at night the unearthly howling of a pack of these creatures forces itself upon the attention. It haunts the

outskirts of cities and villages, living on refuse, but always ready to slink into pens for pigs, lambs, kids, and poultry to fall victims to its insatiable appetite, and it will even snatch sleeping puppies from the side of their mother without detection.



INDIAN JACKAL

Lions and tigers are followed by the Jackal to polish off the remains of a feast, when the bigger animals settle their gorged skins to rest. It is supposed to be a cowardly creature, and it is very true that human beings can pass quite closely to a pack without giving offence ; but when hard pressed the animal will fight with great ferocity, and its sharp teeth inflict painful and dangerous wounds. It has a great dread of the civilised dog, but under pressure it will attack hounds, and even the horses of mounted men.

THE BLACK-BACKED JACKAL (*Canis mesomelas*)

The Black-backed Jackal is an inhabitant of South Africa, and is easily distinguished from other species by the white and black mottlings on its back, the black forming a band, broad over the withers, and narrowing towards the tail. The Jackal's attitude towards sheep and lambs is shown in the reward of 7s. 6d. per tail, which the Kaffirs receive for killing the artful depredators. The last prolonged war in South Africa gave the Jackal an opportunity of increasing in numbers, for the Boer farmers were engaged in the military operations, and the usual means adopted for keeping the

animals in check was suspended. For exactly the same reason the leopard made its reappearance in regions where it had not been seen for years.

There is no need to describe the Jackal of Eastern Europe, which displays the usual characteristics of its race. In the neighbourhood of Constantinople it resorts to the cemeteries, where it digs up the graves to satisfy its horrid appetite. The Jackal has a close affinity with the dog, wild or domestic ; and if it were not for its evil odour it would doubtless be largely domesticated. A tame Jackal wags its tail when it is pleased, fawns upon its master ; and a Jackal or a wolf will mate with a dog, which a fox will seldom do. In India and South Africa the sport-loving Briton hunts the Jackal as though it were a fox, and a strong dog-Jackal will provide an exciting run for three or four miles, until it can reach a safe retreat.

THE WILD DOGS

There are various species of the Wild Dog in all the continents except Europe, differing in form and colour, but of very much the same habits wherever they are found.

The Indian Wild Dog (*Canis deccanensis*), often called the Red Dog of the Deccan, is rather larger than the jackal, and much



INDIAN WILD DOG

stronger. It is so swift and untiring in the chase that fleet-footed deer and antelopes cannot escape it, and in the pack it is so fierce, that the tiger is forced to forsake its partially devoured prey in order to seek safety on the low-lying branch or fork of a tree. If 'Stripes' elects to fight for its meal it cannot hope to destroy

fifty or sixty persevering opponents, and eventually sinks down from weariness and loss of blood.

The Dingo (*C. dingo*) is one of the few non-marsupial animals of Australia, possibly a descendant of some Asiatic species introduced into the island long ages before the advent of the white man. In



DINGO AND YOUNG

colour it is reddish brown; its muzzle is pointed, its ears are sharp, short, and pricked up, its tail is pendent and rather bushy, and its eyes, small and cunning, are placed obliquely in its head. The early settlers in Australia were speedily at their wits' end to protect their imported sheep, and when the

few farmers of one colony lost one thousand two hundred sheep and lambs in three months, it was time to take vigorous action to minimise the losses. Nowadays the Dingo is restricted to small packs, and those only in regions where they are likely to do little harm. Of all the dogs, this species exhibits the most remarkable tenacity of life. Often it has been "beaten so severely that it was supposed all its bones were broken, and it was left for dead," yet the apparently lifeless creature has been seen to rise, shake itself, and slink into the bush. Upon one occasion a presumed dead Dingo was brought into a hut for the purpose of being skinned; and such was its almost incredible fortitude that it suffered the operator to remove the skin from one side of its face before it allowed any symptom of life or sensation to escape it. The Australian natives domesticate the Dingo to some extent, although it can never be relied upon not to escape to the wilds. In captivity it often preserves its wolfish and treacherous nature; but as a rule it is tractable, and at the Zoological Gardens, Regent's Park, puppies are regularly bred and sold.

The Cape Hunting Dog (*Lycaon pictus*), though belonging to a distinct genus, for convenience may be taken out of strict order. It is a long-legged, large-eared animal, suggesting a cross between a wolf and a hyæna, and is the scourge of the African continent.

The abundant antelopes provide the ravening packs with ample sport, and when a large buck is run down, nothing but bare bones will be left inside a quarter of an hour.

Gordon Cumming once found himself in a serious predicament. Near a pool he dug a hole in which to secrete himself while lying in wait for agnu as it came to drink. After he had achieved his object he fell asleep, from which he was aroused to find himself surrounded by forty or fifty Hunting Dogs. When the hunter discovered that he had forgotten to reload his gun,



CAPE HUNTING DOG

and could not reach his ammunition, the blood curdled over his cheeks, and the hair bristled on his head. He then recollected that the human voice has a remarkable power over even wild animals. Shouting loudly, and waving his blanket, he sprang out of the hole, and though the dogs barked furiously, they retreated sufficiently for Cumming to reload his weapon, but before he could use it the pack had fled like the wind.

THE DOMESTIC DOG

The Dog was domesticated by man before the dawn of history. Its original parent is doubtful, but it may be accepted that it is descended from the wolf or the jackal, and interbred through thousands of years until it is impossible to trace its lineage. Even the briefest description of the numerous breeds and varieties is beyond our space. It must be remembered, however, that the marked differences in size and colour, etc., are quite artificial, and due to man's selection and mating the animals. If a very mixed collection of breeds were turned loose into the wilds, where they could forget their associations with mankind, they would speedily revert to nondescript animals, little better in appearance than their really wild brethren; they would associate in troops, would attack poultry and pigs, which formerly they guarded, and would even destroy

foals, notwithstanding their old-time acquaintance with horses. But of all animals, the Domestic Dog appeals to us most. From the big mastiff, bloodhound, or St. Bernard, down to various toy breeds only a few inches in length, all are the friend of man. They aid him in the guardianship of his home and property, assist him by skill and endurance in the chase, act as draught animals in the Arctic regions, and everywhere, by affection and intelligence, secure for themselves a place in the very forefront of the brute creation.

Reference must be made to the semi-wild animals of Eastern countries which are commonly called Pariah Dogs, ugly, homeless brutes, whose bleary eyes and loathsome skins are in keeping with their scavenging methods of gaining a living. Originally they were doubtless simply homeless domesticated dogs that in some regions, in the course of time, interbred with wolves and jackals to add to their wildness. They are tolerated in many Eastern cities for the good services they render in clearing the streets of offal and refuse, but no Pariah Dog has any idea of human companionship, or ever enters a human habitation. Living a kind of republican existence, they divide the streets and alleys into separate confederate states, and no dog of one district is allowed to trespass upon the domain of another section, but is at once chased back to its own proper location. In the Scriptures the Dog is always mentioned with contempt, and the habits of the lazy, filthy scavengers would, of course, ever prevent them being viewed as pets.

THE FOXES

In the true dogs the pupil of the eye is round, whereas in the Foxes it is elliptical, and for that difference alone some naturalists would refer the animal to a distinct genus. The ears of the Foxes are triangular in shape, and the tail, generally more than half the length of the head and body, is always exceedingly bushy. Europe, Asia, Africa, and North America possess some species or variety of this group; all are nocturnal, and most of them display proverbial cunning.

THE COMMON FOX (*Canis vulpes*)

The Common Fox is about two and a half feet in length without the tail, and, owing to its short limbs, is only a foot in height. The colour of its fur is reddish fawn, mingled with black above and white beneath. It resides in an 'earth,' or burrow, gained by a subterranean passage, winding its way among the roots of large trees, or between heavy stones. Here the vixen rears her four or five offspring with devoted care. In diet the Fox is omnivorous, preying upon hares, rabbits, ground birds, rats, mice, frogs, insects,

and even worms ; it has a most voracious taste for poultry, and if it gain access to a hen-roost speedily reduces it to a shambles.

In the British Isles the Fox is preserved for purposes of sport, or it would long ago have become extinct, and, even as it is, in some districts the supply is only kept up by renewals from the Continent. The native cunning of the animal is best exhibited when it is chased by hounds. It is furnished with very powerful scent glands, and in its flight it lays an unerring trail ; even human nostrils can often detect that a Fox has crossed the path. There is no end to the wiles which a hunted animal employs to throw its pursuers on a false scent ; it will double on its own track, and then spring aside



COMMON FOX

to a considerable distance that it may steal away while the dogs urge madly forwards ; it will hide in a tree at a height as great as thirty feet, if it can spring into a low-lying fork ; it will run along the top of a hedge ; and by one artifice or another will sometimes lead the chase across country for a distance of nearly thirty miles, and even then will finally effect its escape.

In the south of Europe the Fox is frequently dark on the underparts, in which it coincides with its Indian brethren, but notwithstanding variations in size and colour the Common Fox of the northern regions of both hemispheres and Africa, north of the Sahara, is practically one species.

THE ARCTIC FOX (*Canis lagopus*)

The Arctic Fox inhabits the regions beyond the Arctic Circle in both hemispheres, where, to withstand the rigorous climate, it is clothed with thick fur to the soles of its feet, hence the name 'lagopus,' or hairy-foot. This animal has a blunter muzzle and less pointed ears than any other Fox. During the short summer months the silky fur is grey or dirty brown, often with a wash of blue, but with the approach of the cold season the colour changes to a beautiful white. The change is gradual, which leads to the creature being called by various names, such as, Blue Fox, Pied Fox, Stone Fox, etc. Hunters eagerly trap the white-coated Fox,



ARCTIC FOX

which is less cunning than the red species, giving opportunities for easy shots, and readily entering traps. It exists chiefly upon birds. Often the animal lives in burrow communities of from twenty to thirty, which habit is all in favour of the trapper securing a good bag; the skins are worth less than those of the common red Fox. The pelt of the Black, or Silver, Fox (*Canis argentatus*) of North America, ranks highest of all. Its colour is mainly a deep black, but the long hairs having white tips give the creature a beautiful silvery aspect. A single royal Black Fox-skin garment of the Emperor of Russia was valued at £3500; this was a magnificent pelisse, exhibited at the Exhibition in Hyde Park in 1851. Such a garment would now be even more valuable, as since that date the animal has become scarcer.

THE FENNEC (*Canis zerda*)

The Fennec is a fox-like little animal found in Northern Africa, especially Nubia and Egypt. Its body does not exceed a foot in length, and its bushy tail, and its still more remarkably large ears, give it a decidedly quaint appearance. In colour it is generally a very pale fawn, sometimes almost a creamy white. The animal is nocturnal, hiding by day in a burrow which it scoops in the light, sandy soil. Bruce, who introduced the Fennec to European zoologists, averred that it built a nest in trees, to which belief he was doubtless led by seeing it feed upon fallen clusters of dates, although in the main it is a carnivorous animal and particularly fond of eggs and insects.



FENNEC

FAMILY : MUSTELIDÆ

THE WEASELS

The family of the Weasels is a large and important one, and there are few portions of the earth where it is not represented. Many of the members of the family are quite serpentine in aspect, and because of their slender, elongated figures, they are called the vermiform (worm-like) mammals. Most of them are burrowers as well as agile climbers, and the leaping powers of many are out of all proportion to their short legs. Though the teeth are not so exclusively carnivorous as those of the cats, the canines are long, sharp, and slightly curved backwards, and the molars are studded with points and edges. In absolute size the biggest of the tribe does not appear formidable, but there are no creatures more predaceous, no natures more fierce, no habits more bloodthirsty. They are mainly terrestrial animals, preying on small mammals, birds, etc., very often doing no more than suck the blood of their victims ; the otters form the aquatic section of the family, and are equally destructive to fish. It is characteristic of the Weasels to bite with unerring instinct into a large artery or vein, and it is this deadly form

of attack, added to the high development of their muscular powers, that enables them to overcome creatures exceeding themselves many times in size and actual strength. Though the majority of the Weasels are obnoxious in character, and equally so in odour, some of them are clothed with magnificent furs.

The family consists of three sections, viz., the Weasels proper, the Skunks and Badgers, and the Otters.

THE PINE MARTEN (*Mustela martes*)

The Pine Marten is an inhabitant of the northern regions of both hemispheres, but in the British Isles it is rare almost to extinction. It is a tree-loving animal, only twenty inches in length, with a long and bushy tail; the fur is varying shades of brown, and a



PINE MARTEN

really fine skin is little inferior to the celebrated sable. A couple of Martens will sometimes take up their quarters in the nest of a squirrel, rook, or magpie. In Belvoir Park, County Down, a boy engaged in bird-nesting put his hand into a nest to secure what he was assured would be the eggs of a magpie. The severe bite he received showed that the nest had already been robbed.

Generally, the home of the Marten is in a hole of a decaying tree, and if it is anywhere near the habitations of man, care will need to be exercised to prevent a fowl-house tragedy, for the slaughter of a hen and brood of chicks, or eating a sitting hen and her eggs, is a small matter to a ravenous Marten. One morning a farmer found that fourteen lambs had been killed during the night by some unknown creature, a tigrine cat or a lynx could not have been more destructive. On the following night seven more lambs were destroyed, but in the morning the culprits were seen leaving the scene of bloodshed. They proved to be a couple of Pine Martens, who had taken up their abode in a deserted magpie's nest in Tollymore Park. Such an incident gives weight to the statement concerning the fatal accuracy with which the weasel tribe bite

their prey, the wounds being only those that will speedily drain the victims' life blood.

The Beech Marten (*M. foina*) is found in Central Europe, often in the same regions as the Pine Marten. It is marked with yellowish white on its throat and upper portion of its breast. The Martens are less offensive in odour than many of their close relations.

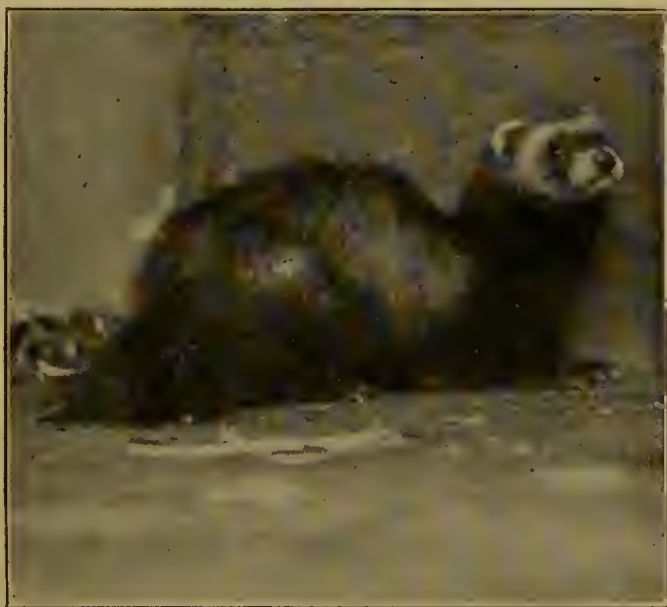
THE SABLE (*Mustela zibellina*)

The Sable, owing to incessant persecution, is now almost restricted to Eastern Siberia. It so much resembles the pine marten that some naturalists have viewed it but as a local variety. Of all furs, sable is one of the most esteemed; it is of a deeper, richer brown than that of the marten, and is in its greatest perfection during the depth of the northern winter. The Sable is rather a rare animal, and exhibits such caution that a hunter accounts himself fortunate if he find one trap successful out of every dozen. Very often a trapper's beat will be fifty miles in length, in the course of which he perhaps sets a hundred and fifty fall traps, in which a captured animal is little likely to damage its fur. The trapper's calling is full of privations, and not infrequently he loses his life in order to obtain the much-prized skins, of which even small ones fetch from three to ten guineas before being dressed by the furrier.

THE POLECAT (*Mustela putorius*)

The Polecat is a little less in size than the marten, and has a much shorter tail. It is a most noxious pest to the farmyard; there is no animal more deadly to rabbits, game, and poultry, and, consequently, it has been almost exterminated in the British Isles. The animal's inner fur coat is pale yellow in colour with an outer covering of dark brown hair, while the head is marked with black and white.

If one of these blood-thirsty animals can gain access to a poultry house, it will destroy fowls, geese, and even turkeys. It has a lust for killing, and seldom leaves any creature within reach alive, easily putting to death twenty times more victims than it can eat,



POLECAT

in many cases only sucking the blood and eating the brain. Out in the open the Polecat preys upon hares, rabbits, ground game, rats, and mice. When it springs upon its prey the vicious creature effects its purpose with one bite, driving its long canine teeth into the brain, causing immediate insensibility, if not instantaneous death. In one visit to a rabbit warren a Polecat will destroy as many as a score of rabbits. Very often the creature stores up food for future use, and in its burrow have been found frogs and toads and eels ; in the case of the former, a bite upon the brain had not killed them, but had induced a stupor that caused them to make no attempt to leave the larder. When wounded or irritated the Polecat exhales a horrid odour from a pouch near the root of the tail.

THE WEASEL (*Mustela vulgaris*)

The Weasel is one of the smallest of the family, measuring only about ten inches in length, including the tail. The fur is bright reddish on the upper parts, and the under parts are a pure white ; and the sharp contrast renders it rather a pretty little animal. For its size there is perhaps no bloodthirstier creature in the whole animal world. It is exceedingly vermiform in build, and can worm its way into the runs of rats and mice, upon which it wages unceasing war ; and for its usefulness in this direction some people are willing to run the risk of the occasional loss of chickens and ducklings. The pertinacity of the Weasel is remarkable, hunting its prey by scent, and even crossing water, until it can leap upon the back of its victim, and fix its teeth in the back of its neck, or pierce its brain. It will creep upon a covey of partridges, and as the birds whirr up on the wing will spring up as high as a couple of feet, and bring one down to the ground.

Weasels will unite their forces for hunting, and as they often live in communities, a number of them will make a joint attack upon anybody disturbing them. A cow has been badly bitten on the dewlap by the fierce little creatures near whose home she was grazing ; and often strong men have been sorely beset, and but for the arrival of assistance must have sunk under the united and pertinacious attack. In such a case the creatures run up the legs and body of a human being and direct their efforts to the throat. The person attacked is given no leisure to kill or maim his antagonists, all he can do is to fling them to the ground for them to return to the fray with redoubled ferocity.

A kite was once seen to pounce upon some object and carry it from the ground. In a short time the bird showed symptoms of uneasiness, trying to free itself from some annoying object by means of its talons, and flapping about in a very bewildered manner. In a few minutes the kite fell dead to the ground, and a Weasel ran away from the body, apparently uninjured. On examination

of the kite's body, it was found that the Weasel, instead of becoming the bird's repast, had attacked the unprotected parts which lay beneath the wings of its captor. A considerable wound had been made in that spot, and the large blood-vessels torn through.

The Weasel is the most prolific of the whole family. Most of them have a litter of four or five young ones in the spring; but the Weasel will have three or four families during the year.

THE STOAT (*Mustela erminea*)

The Stoat, or Ermine, is a vicious little beast, an inveterate slayer of any creature which it can overpower. It is only fourteen inches in total length, of which the tail accounts for one-third; but there is considerable variation in size. When a gamekeeper becomes aware that a Stoat is in the neighbourhood, he does not rest satisfied until he sees the animal hanging upon his vermin pole. In a Stoat's larder have been found as many as fifty pheasant eggs, removed into hiding with such care that not one shell was cracked; in another case five hares and four rabbits were in storage, the bodies unmangled except for the single death-wound in the throat or back of the neck.

Our British Stoat in summer has a distinctly fine coat, reddish brown above and yellowish white below, which in winter changes to a delicate creamy yellow. In the higher and colder latitudes the winter coat of the animal becomes longer and quite white; it is then the true ermine that decks the robes of the sovereigns of Europe, the Pope and cardinals of the Church of Rome, the nobility and judges. Degrees of rank are indicated by the number and arrangement in rows or bars of spots of the black wool of the Astrachan lamb. In olden times the wearing of ermine was forbidden to persons not of royal birth, but nowadays it is used for muffs and trimmings for anybody who can afford such expensive wear.

THE FERRET

The Ferret, a whitish, or pale yellow animal with pink eyes, is really only a variety of the polecat. It is a native of Africa and was introduced into Europe by way of Spain. It is kept in a state of semi-domestication for employment in rat-catching and rabbit-hunting, in which latter case it is frequently muzzled, or it would slay the rabbits in the burrow instead of driving them out to the guns. When a Ferret escapes from



FERRET

confinement it is difficult to recapture it until the coming of the cold weather, when it will often seek its old quarters for warmth, being quite unlike the hardy polecat, which can endure the most rigorous cold, and track its prey for many miles in the snow.

It is asserted that the Ferret is capable of kind feeling, and will sometimes follow its master like a dog ; but in any case it is unwise to place reliance on the tameness of an animal owning a blood-thirsty kinship with the typical weasels. A poor woman returned home after a brief absence to find her baby, which she had left in its cradle, in a fearfully wounded state, its face, neck, and arms being torn, some of the chief blood-vessels opened, and the eyes greatly injured. The mother ran screaming to the house of a surgeon, who, after attending to the wounded child, accompanied the woman to her house. The Ferret had hidden itself, but upon hearing the infant's cries it made a furious attempt to renew its sanguinary repast. Even when the surgeon kicked it the animal endeavoured to run up his leg, and not until its back was broken did it cease its ferocious attack.

THE MINK (*Mustela lutreola*)

The Mink, largely aquatic in habit, may best be described as a water polecat, living chiefly on fish, frogs, crayfish, and any small mammals that frequent water. Its body is from fifteen to eighteen inches in length, and is more stoutly built than the majority of the weasels. The fur of the Mink is almost dark chocolate in colour ; it is highly valued, and is often fraudulently substituted for sable. Much deception is practised in connection with furs, and it is quite possible for white rabbit-skins to be 'faked' so as to resemble ermine sufficiently to deceive the inexperienced.

The Mink is found in Europe ; in America it often takes the place of the ferret, and on the 'Minkeries' or Mink-farms, considerable numbers of the animals are reared for the sake of their furs. Silver-grey Mink skins are of the most value, often realising as much as five guineas each, when ready for making up into a muff, which may require half a dozen skins. The Blue Fox is reared similarly in the Behring Islands, where the sealing industry provides plenty of food ; but no attempt appears to have been made to rear the sable, although its skin is often worth as many pounds as other furs are worth shillings.

THE GLUTTON (*Gulo luscus*)

The Glutton, or Wolverine, though only two or three feet long, in addition to its thick, bushy tail of seven or eight inches, is so stoutly built as to resemble a small bear. It is covered with long hair, mainly brownish black in colour, with the sides of a rather lighter tint ; the muzzle is black, and so are the paws, in which the ivory whiteness of the claws stands out rather curiously.

Inhabiting a great part of Northern Europe, Siberia, and the northern regions of Canada, the Glutton feeds largely on the smaller quadrupeds and larger game. In summer it is the inveterate enemy of the beaver, but in winter even the Wolverine's strong and curved claws cannot break through the ice-hardened walls of the lodges where the beavers ensconce themselves. It was once popularly believed that the animal deliberately placed moss under a tree to attract the reindeer, upon which it would then leap from the branches. The Glutton is hated by the fur-hunters, for the animal follows them on their rounds, artfully despoiling their traps of bait or captives. Very frequently it will scent out the trapper's 'cache,' or store of provisions, and when it has eaten everything of an animal nature will scatter the remainder broadcast. The despoiler itself is very difficult to trap, and even when the hunter does secure a Wolverine skin, its value, though considerable, by no means atones for the damage which the creature has been working over a sable or marten round.

THE SKUNK (*Mephitis mephitis*)

The Skunk is an American animal, the common species of which is found in the northern regions of the continent, while the White-backed Skunk ranges over all South and Central America as far north as Texas.

The animal is about a foot and a half in length, exclusive of the long, bushy tail; its legs are short and furnished with sharp claws for burrowing. The fur of the two species only differs in the varying proportions of the black and white upon a background of brown. Mice,



CANADIAN SKUNK

frogs, insects, and the eggs of ground birds form the staple food of the creature.

The Skunk possesses the foulest odour of any known animal. Various species of the weasel tribe give off noisome exhalations; but all of them put together are but the perfumes of Araby compared to the nauseous liquid which the Skunk can eject from its glands with sufficient force to reach a distance of from twelve to

sixteen feet. To the animal itself the fluid is a valuable means of defence, for no enemy can tolerate being overwhelmed with an odour so offensive and lasting. Should a single drop of this horrid secretion fall on the dress or skin, it is almost impossible to relieve the tainted object of its disgusting influence. A dog, whose coat had suffered from a discharge from a Skunk's battery, even after a week had elapsed, rendered a table useless by rubbing itself against one of its legs. Provisions only in the neighbourhood of the odour become uneatable, and clothes, soiled by but a single spot of the liquid, retain the smell for several weeks even after frequent washings. Dogs are trained to capture the Skunk by springing upon it before it can discharge the vile fluid, and its flesh is said to be more than merely palatable, if the offensive glands are immediately removed.

The Cape Polecat, or Zorille (*Ictonyx striata*), agrees more with the true polecat in size, but in odour is first cousin to the skunk. Its distribution extends from the Cape to Senegal, and another species is found in Egypt and Asia Minor. Though it cannot climb like the polecat, its habits and food are very similar; and in some regions it is tamed for the purpose of catching rats and mice.

THE BADGER (*Meles taxus*)

The Badger, a native of Europe and Northern Asia, is still fairly common in some parts of the British Isles. Though one of the weasel tribe, it is so awkward in its rolling gait, that in the dusk it may easily be mistaken for a young pig when it issues from its burrow. The animal is a marvellous digger, exceedingly powerful muscles working the fore-limbs, which are furnished with long curved claws. Not infrequently several Badgers will form their burrows close together; and the female has no objection to taking up her quarters and rearing her three or four young in a fox earth, for, notwithstanding frequent statements to the contrary, the fox and the Badger are not unfriendly.

The average length of the Badger is two feet six inches, and its height at the shoulder is about one foot. The body is reddish grey in colour, changing to white-grey on the ribs and tail. The head is white, except for a definitely marked black line on each side; the throat, chest, abdomen, legs and feet are of deepest brown. Badger skins, dressed with the hair on, were formerly much used for covering travelling-trunks, and the long hairs are extensively employed in the manufacture of shaving and artists' brushes.

The food of the Badger consists chiefly of roots, fruit, snails, worms, wild honey, and sometimes young rabbits. Owing to the looseness of its skin, and the thickness of its hair, it can rob the nests of bees and wasps with impunity, the stings of the infuriated insects taking little or no effect.

Naturally a very harmless animal, the Badger is a terrible antagonist when provoked ; its sharp teeth not only bite severely, but the jaws lock together by a peculiar structure of their junction with the skull, and retain their hold without the need of any special effort on the part of the animal. Baiting the Badger with dogs was once a popular sport, its tough skin and coarse hair largely nullifying the bites of its tormentors, which were often badly mangled before the quarry was overpowered by numbers. The animal is now rare in most districts, but in any case modern sportsmen would not resort to the old-time cruelties ; young dogs were trained for the sport by being set to worry an animal whose teeth had been drawn, and even its under jaw sawn off. The breed of



COMMON BADGER

dogs called 'Dachshund' are German Badger dogs, their long bodies and short legs enabling them to enter a burrow to bolt the Badger out into the open.

In Scotland the Badger is called the 'Brock.' Though the animal secretes an offensive substance, in some regions its hams are cured, and are considered a great delicacy.

There are other members of the Badger tribe, such as the American Badger (*Taxidea americana*), which is extremely numerous in some parts of the United States ; the Teledu, or Malayan Badger (*Mydaus meliceps*) ; the Indian Sand Badger (*Arctonyx collaris*) ; and all of which are more or less similar in habit to the British species. The Teledu ejects a volatile liquid so pungent and acrid as in some persons to cause syncope. It is said that in captivity the animal is easily tamed, but most persons would prefer to look further for a pet than one capable of poisoning the air of a whole village.

THE EUROPEAN OTTER (*Lutra vulgaris*)

The Common Otter is general throughout Europe and Northern Asia. It is rather a fierce, shy animal, largely nocturnal, and living in a burrow in a river bank, or under the roots of an old tree. Its entire length is little less than three feet and a half, of which the tail occupies fourteen or fifteen inches; the average weight when fully grown is about twenty-four pounds, but British specimens sometimes scale forty pounds. It is lithe and serpentine in shape; the toes are webbed, and the tail is long, broad, and flat, forming an excellent rudder for directing movements in the water. Next



EUROPEAN OTTER

to the skin is a fine, soft, light grey fur, while the outer coat is composed of long, shining, and coarser hairs of a rich brown tint.

The Otter very well may be viewed as a water weasel. It is exceedingly rapacious, destroying more creatures, especially fish, than it can devour. In Scotland, where the animal is more numerous than elsewhere in the British Isles, on the banks of streams are frequently found salmon, perfectly fresh, and entire except for a few inches which have been bitten out along the back. Many poor people view the Otter as a friend, welcoming the daily salmon, which is none the worse for the lack of the piece to which the aquatic weasel has helped itself; but water-keepers regard the animal with very different feelings.

It is extremely interesting to watch the actions of this very aquatic creature. It slides noiselessly into the water, turns and

twists with as much ease as a fish, admirably served by the feet, which act very much in the same way as fins. The Otter, when unable to secure fish, will travel overland with a curious loping gallop, perhaps five or six miles, in search of food; and if it find its way into a farmyard it will prey upon poultry, young pigs and lambs.

Otter-hunting is still practised in some parts of the country. Dogs are assembled, and the hunters, armed with spears, go out in sufficient numbers to kill a tiger. When the animal has been located it is surrounded, so as to cut off any way of escape, and the chase commences in real earnest. It dives when it is driven from one retreat to another; it bites and scratches the dogs at close quarters. It is remarkably tenacious of life, and only when weary from its exertions, and weakened by the wounds of spears and the bites of dogs, is it possible to despatch it. It bites and snaps to the last and dies without a murmur.

There are nearly a dozen species of Otters, the largest of which is the Brazilian. In India and China tamed Otters are employed by the natives to assist in fishing operations; generally they only drive the shoals into the nets, but the Chinese teach their Otters to catch fish with their teeth and bring them ashore. The fur of all Otters is in great request; and the skin of a Canadian animal is probably more valuable than that of any other fur-bearing animal of that region.

THE SEA OTTER (*Enhydra marina*)

The home of the Sea Otter is on the shores and islands of the North Pacific; it is larger than the animal just described, attaining an extreme length of four or five feet, and a weight of seventy or eighty pounds. Its fur is markedly beautiful, in colour mainly a rich brownish black, while the under portions of the body are lighter in hue; and as these skins are valued at a high price, the animal has been so relentlessly hunted that it has become quite scarce, for it is by no means so prolific as many of its relations. The food of the Sea Otter is not restricted to fish; it also eats molluscs and crustacea, and even seaweed and other vegetable substances, in which last it follows the example of the common Otter when its ordinary food is scarce.

The Sea Otter is gregarious, gathering in companies of several hundreds. The hunters formerly went out in boats and forced the creatures to dive continuously until they were exhausted, when it was easy to spear them; but modern hunters employ the rifle, and are thus able to capture animals at a distance of a thousand yards. The use of the rifle, too, permits hunting all the year round, and consequently the never-ending persecution is now resulting in fewer skins coming into the market.

FAMILY : PROCYONIDÆ

THE RACCOON (*Procyon lotor*)

With the exception of one Indian genus, the home of the Raccoon family is in America, and though externally the various members are by no means alike, they are all distantly related to the bears.

The Raccoon is about the size of a small fox. The fur of the animal consists of a woolly grey coat next to the skin, from which project longer hairs, marked alternately with black and greyish white. The face is patched with dark blackish brown; the



RACCOON

short bushy tail is ringed with black upon a ground of dark grey. It is nocturnal in its habits, and spends the day curled up in the hollow of a tree. It is an expert tree climber. It feeds upon either animal or vegetable substances, and, whenever opportunity offers, it rinses all its food in water before eating it, hence the title 'lotor,' or washer, while

very often the animal is called the Washing Bear. Sometimes in captivity a mother Raccoon transfers her washing proclivities to her offspring, and literally washes them to death.

The Raccoon ranges from British Columbia to Paraguay, and a 'coon' hunt by night is a common and favourite sport. An experienced dog having tracked an animal to its place of concealment in a tree, a blazing fire of pine chips soon illuminates the branches, so that a good climber can locate and dislodge the quarry. The chase through the woods in the light of torches is picturesque and exciting, and in the end results in the provision of a delicate meal and a fur that is in large demand for carriage-rugs, etc.

THE RED COAITI (*Nasua rufa*)

The long-snouted, ring-tailed, reddish-brown-coated animal is a native of South America, where it is extremely active among the trees, pursuing its prey with great certainty. Waking up from its

daytime lethargy, the Coaiti careers about the branches with extraordinary rapidity, agitating its mobile nose as if for the purpose of discovering by scent the presence of some welcome food. It is



COAITI

a merciless robber of birds' nests, and will eat parent, eggs, or young with equal zest.

A commoner species is the White-nosed Coaiti (*N. narica*), usually dark-brown in colour mottled with black. Both of these animals are capable of domestication, and although they are too capricious in temper to be viewed as pets, they will clear premises of rats and mice. In a garden they will catch snails and slugs, but with their sharp claws and extraordinary snouts they will soon make havoc of the beds in their digging after worms.

THE KINKAJOU (*Cercoleptes caudivolvulus*)

The Kinkajou holds its food in one hand, while it picks it or breaks pieces off with the other, and doubtless this characteristic had much to do with the earlier naturalists classifying the animal with the lemurs; but notwithstanding the flat surfaces of its under teeth, and its prehensile tail, it more closely approaches the carnivorous type.

When full grown the Kinkajou is equal in size to a large cat, but is much stronger in proportion to its dimensions. Its pretty fur is light dun in colour, traversed by very faint bands of a darker shade. It possesses a remarkably long and flexible tongue, with which it examines the smallest crevices in search of insects, etc. An article of food that is beyond the reach of the creature's lips will often be seized by the extensile tongue, and where that organ is not sufficiently long, the prehensile tail will sometimes be pressed into service.

The Kinkajou is very nocturnal, and daylight causes it more inconvenience than it does to the owl. With the approach of dusk the animal becomes extremely lively, running up and down the branches with great skill in search of fruits, insects, honey, small birds, eggs, etc. It is easily tamed, and when domesticated is of a sportive nature, delighting to play with those persons whom it trusts, and making pretence to bite, after the manner of puppies and kittens. In a wild state, however, it is a rather fierce animal, and when assaulted, offers a spirited resistance to human foes



KINKAJOU

FAMILY : URSIDÆ THE BEARS

The Bears, heavily-built, plantigrade animals, form a very distinct group of the Carnivora, and are the largest beasts of prey in the Northern Hemisphere. They are found in almost all quarters of the globe, and different species are fitted to endure the heat of the tropics or the rigours of the frozen north. Except in some of the tropical species the fur is coarse, thick, and long, and save for a lighter collar, generally of one colour, in the majority of instances either brown or black. The cats and most of the dogs have five digits on the front feet, and four on the hind ones ; but the Bears have five toes on each foot, armed with long, sharp, non-retractile talons, which are most efficient weapons of offence. Should the adversary elude the quick, heavy blows of the paw, the animal endeavours to overcome it by sheer pressure. All of the Ursidæ are omnivorous ; to animals in captivity a leg of mutton, a pot of honey, a potato, an apple, or a bun are acceptable, and in a wild state most of the Bears are almost equally complacent.

THE BROWN BEAR (*Ursus arctos*)

The Brown Bear is still fairly common in the forests and mountainous regions of Europe, and it extends into Asia as far as the Himalaya. It attains a length of from five to seven feet, the

larger ones being Asiatic. It was formerly found in the British Isles, but the last one was killed in Scotland in 1057. The animal appears to grow up to its twentieth year, and specially fine examples turn the scale at eight hundred pounds ; it has been known to live in captivity for quite half a century.

Sluggish in movement and in temperament, too, compared to



BROWN BEAR

most of the carnivorous animals, the Brown Bear is really dangerous only when pressed by hunger or held at bay by a foe. In guarding itself from blows it is singularly adroit, and is easily the most accomplished pugilist of the animal world. Even in settled regions a Bear seldom takes to cattle-killing, but it will work havoc in a field of standing corn. Sitting on its haunches, it collects almost a sheaf at a time, biting off the ears and then reaching out for another armful.

Bear-baiting was an old-time British sport, and it is on record

that the town of Norwich had to supply annually to King Edward the Confessor a Bear and half a dozen dogs to provide royal amusement ; and certainly up to the time of Queen Elizabeth a Bear tied to a pole and worried by dogs always stirred the populace to enthusiasm. The Brown Bear is captured by various methods, of which the following is one of the most interesting. Knowing the animal's fondness for honey, a hive is placed in a tree, and in front of it is suspended a heavy log of wood. The Bear pushes the log aside, only to receive a hard blow on the head as it swings back. Presently it gets exceedingly angry, and gives it increasingly hard pats, with consequent sounder blows from the log in return. Finally, the Bear is knocked off the branch, and falls upon spikes placed in readiness to receive and impale it.

The Bear is a good climber, and a very competent digger. For the coldest months of the year it prepares a retreat in which to hibernate, and at the end of a several months' sleep it issues, a mere skeleton of its former self, and with a ravenous appetite in due proportion. It is during this period of seclusion that the female brings forth her young, from one to four in number.

Bears are water-loving animals, and are excellent swimmers. One of this species lived for fourteen or fifteen years in the Zoo without a tubbing. When at length he was promoted to a bear-pit, which contained a small pond, the delighted animal spent whole days sitting in the water, luxuriating in the first bath of its life.

The American Black Bear (*Ursus Americanus*) is less in size and not so formidable as its European relative. The Himalayan Black Bear (*U. torquatus*) is generally only half the size of the brown species ; it has a chevron of white upon its breast. Though it is mainly a vegetable feeder, it will occasionally kill sheep and ponies, and it has little hesitation in acting offensively towards man. The Spectacled Bear (*U. ornatus*) of South America has tawny rings round its eyes, which give it rather a comical aspect. The Syrian Bear (*U. Syriacus*) is the Bear of the Scriptures, now found only in the fastnesses of Hermon and Lebanon. It is a small species, and is a confirmed raider of orchards and vineyards.

THE GRIZZLY BEAR (*Ursus ferox*)

The Grizzly Bear, or 'Ephraim,' as hunters style it, sometimes measures nine feet in length, and weighs as much as an average carthorse, or about three times the weight of a lion. Most members of the ursine family are prepared to give man a wide berth, if they are unmolested ; but the Grizzly will assume the offensive the moment it perceives a man, whether he be mounted or on foot, armed or otherwise.

The coat of the animal, as implied by its name, is chiefly brown, grizzled with white, or it is a steely grey. Its terrible chisel-like



PLATE VI

Polar Bear
Grizzly Bear

claws are five or six inches in length, and it is easily the most ferocious and formidable animal of the North American continent. It is particularly tenacious of life, and even when riddled with bullets will continue to fight until its head or heart is pierced. To kill a Grizzly in fair fight is accounted a high honour, even among experienced hunters; and among the Red Indians a necklace of claws was the hall-mark of distinction among the braves of a tribe.

In the early days of the colonisation of North America the settlers had not the advantage of express rifles, and men have been chased by an infuriated animal a distance of twenty miles. Often a traveller prepared himself for such an experience by taking advantage of one of the animal's characteristics. He carried with him a quantity of meat impregnated with some strong perfume. If he came to close quarters with a Bear he threw down a small piece of the prepared meat, which the animal would stop to sniff suspiciously before eating it and resuming the chase. This gave the traveller time to get well ahead, and a repetition of the ruse often enabled him to tire the Grizzly out, or meet with friends to assist in despatching the fierce creature.

THE MALAYAN BEAR (*Ursus malayanus*)

An adult of this species rarely measures more than four feet six inches in length. The fur is particularly fine and glossy, and the hair is shorter than that of the animals already described; it is chiefly deep black in colour, with the exception of a semi-lunar patch of yellowish white on the chest, and a similar mark on the



MALAYAN BEAR

snout and upper jaw. The lips and tongue of the animal are extremely flexible, and can be prolonged to a great extent, which is very serviceable in licking out the contents of the nests of the wild bee. The claws are extremely long, and the animal spends no inconsiderable portion of its time in licking them, which is a very common ursine habit. The Malayan Bear is almost entirely a vegetable feeder, and a sad depredator in cocoanut groves. Most of the bears are easily tamed, but Sir Stamford Raffles allowed one of this species to have the run of the nursery, and was never once obliged to chain it or administer chastisement. The specimen in the Zoological Gardens sits on its hind legs, making the most grotesque gestures with its fore-limbs, and rolling its body from side to side with untiring assiduity.

THE SLOTH BEAR (*Melursus ursinus*)

The Sloth Bear is a shaggy, clumsy animal, in marked contrast to its sleek foregoing cousin. Earlier writers asserted that it was



SLOTH BEAR

rather a gentle and affectionate creature ; but Sir Samuel Baker declares that it causes more accidents to the natives of the mountainous parts of India than any other animal, and Major Cumberland

says that when cornered it is a perfect fiend for clawing and biting. The natives are attacked chiefly when they stumble upon it unawares in the jungle, in which case it is supposed that the animal's onset is more the result of timidity than actual ferocity. Nevertheless, the result is equally bad for the native, for the Sloth Bear will bite and claw its victim to death. A female with young will make most unprovoked attacks, and fight with a fierceness exceeding that of some of the larger animals.

THE POLAR BEAR (*Ursus maritimus*)

The Polar, or White, Bear is the aquatic member of the family. Its home is on the ice-bound shores of the Arctic Ocean, and its dense coating of hair renders it immune to the severest cold. It has been seen swimming eighty miles from land, and it is frequently observed upon icebergs that have floated southwards into the track of Atlantic passenger steamships. So active is it that it will plunge into the water in chase of a salmon, and will return to the surface with the captured fish in its mouth.

The Ice Bear is longer in the body than any other of the family, growing sometimes to a length of thirteen feet, and even average-sized animals will weigh anything up to sixteen hundred pounds. The colour of the fur is a silvery white, tinged with a slight yellow hue, though variable in different individuals. The feet are armed with strong claws of no very great length, and only slightly curved. Their colour is black, so that they form a very bold contrast to the white fur that falls over the feet. Even at a considerable distance, the Polar Bear may be distinguished from every other member of the Ursidæ by its peculiar shape. The neck, although extremely powerful, is very long in proportion to the remainder of the body, and the head is so small and sharp that there is a very snake-like aspect about that portion of the Bear's person.

The colour of the fur approximating very closely to its surroundings, the Polar Bear is able to approach its prey without its huge bulk being easily perceivable, and the underpart of the paws are clothed with hair, which renders its footsteps noiseless. Thanks to its coloration and stealthy step the animal is able to take by surprise, not only the wary seal, but the walrus as they lie upon the ice. The walrus may weigh nearly a ton, and if it can reach the water the quadruped will stand a poor chance of obtaining that particular meal; but not infrequently the first intimation of danger which the walrus receives is a frightful blow that fractures its skull. In capturing seals the Bear exhibits particular cunning, for it will dive into the water at a considerable distance away, and come up at the hole in the ice which is the seals' only avenue of escape.

The flesh of the Polar Bear is not only less palatable than any

other of the ursine family, but it habitually eats putrid food, and in consequence its own flesh often makes an almost poisonous dish, as Arctic sailors have sometimes discovered to their cost.

Notwithstanding the character of its native habitat the Polar Bear is by no means difficult to keep in captivity, and an animal has lived in confinement at the Zoo for thirty years ; but to rear young ones is a different matter. In November, 1908, a young Polar Bear was born in Regent's Park, and as it was the first since 1866, it was particularly hoped that the little creature would live. Barbara, its mother, however, refused to sustain the character of her tribe for devotion to their young, and the new arrival died from neglect, notwithstanding it was provided with a retriever foster-mother. In 1910 another young bear suffered a similar fate.

In the same year 'Sam' and 'Barbara,' London's two Polar pets, were transferred to a new enclosure containing sufficient water to allow the animals to swim easily. Sam was boxed in a travelling cage in ten minutes, but despite a lavish bait of blubber and fish, Barbara refused to follow her mate's example. Twice she got inside the cage, but before the gate could be fastened, backed out again with crashing force, amid the laughter of a large crowd of onlookers. A bucketful of cod-liver oil was brought, and the superintendent himself winningly besought Barbara to be a good girl, but she was not to be cajoled. At the end of fourteen hours of unceasing persuasion, and no little force, Barbara was corralled and evicted from her old home inch by inch. Once inside the new enclosure, the Polar Bears were speedily gambolling in the water, turning somersaults, and playing water polo with a piece of log.

CARNIVORA OF THE SEA

The large section of the Carnivora just concluded consists of typical, true quadrupeds, or split-footed carnivores, and hence termed the Fissipedia. The Seals and the Walrus form a much smaller group, and are known as the Pinnipedia, or fin-footed carnivores. Some writers would refer these animals to a distinct order, but British naturalists prefer to view them as only a sub-order. Popularly speaking, the Pinnipeds and the Cetacea form the Carnivora of the Sea.

The members of the Pinnipedia, although they breathe atmospheric air, are specially adapted for an aquatic life. They are divided into three families, viz. the Earless, or true, Seals, the Eared Seals, and the Walrus.

Seals have elongated, fish-like bodies. The fore and hind limbs are modified into paddles. The hinder ones are the longer ; in the Earless species these limbs are pressed together and directed backwards for use as a tail fin ; while in the Eared species the hind

flippers are turned forwards under the body, or they project outwards almost at right angles. On land the Seal's movements are extremely clumsy. It shuffles along upon its fore-feet, dragging its hind feet behind it; but the creature's spine is very flexible, and it assists progress by urging the body forward in a series of awkward jerks. The spine is the Seal's chief motive power in swimming, and in the water it is as rapid and graceful as it is ungainly on land. Seals live mainly upon fish, and, consequently, can live only by proving swifter than their prey.

All Seals have hairy coats, rendered waterproof by a fatty matter secreted by the skin. In some cases the pelage consists of an inner jacket of very close, fine, woolly fur, with an outer covering of longer hair. For additional protection from what is often an intensely cold environment, many species of Seal have a thick layer of fat underneath the skin. Commercially there are only two classes of Seals: Hair Seals are those whose value rests in their hides and oil; and Fur Seals are those whose under-fur is used in making highly prized sealskin garments. During recent years, however, the skins of the Hair Seals have been in demand for coats for automobilists.

Of the whole group of pinnipeds, only a few ever resort to tropical regions; the majority of them inhabit solely the waters of the colder latitudes on both sides of the Equator; some of them are wholly Arctic, and at least one is exclusively Antarctic.

FAMILY: PHOCIDÆ

THE COMMON SEAL (*Phoca vitulina*)

There are about eighteen species of Earless Seals, all frequenting the temperate and colder waters of the globe; all without external ears; and all aquatic to a higher degree than their Eared cousins. In particular, they can remain under water a longer time—the average is from five to eight minutes, but often it is three times as long. At every breath the nostrils open widely, and close again by means of a constricting muscle called a 'sphincter'; thus, while the creature is submerged no water can pass into its lungs.

The Common Seal assembles in small herds, and ranges the northern portions of the Atlantic and Pacific oceans, seldom extending as far southwards as the Mediterranean Sea. It is very abundant on many parts of the Irish Coast, and among the northern islands of Scotland. In Bell's *British Quadrupeds* it is stated that this Seal "is now very rarely seen on the shores of the southern and eastern counties of England." In the spring of 1910, however, fishermen were complaining bitterly of the huge shoals of Seals that came into the Wash. A Seal eats about seven pounds of fish per day, and the weight of one in a net is sufficient to break it. At low tide vast stretches of sand in the Wash were black with the

Seals, which have little or no commercial value to atone for their damage to the fisheries. This was all the more strange considering that the Common Seal is not in the habit of making seasonal migrations, but usually frequents the same locality all the year round. This species will often follow sea trout and other fish up rivers, and one has been shot in the Thames at Richmond.

The Common Seal attains a length of five or six feet. It is rather a handsome animal, clothed with stiff, yellowish-grey hair, sprinkled with spots of brown or brownish black, the underparts of the body being lighter in hue. There is no under fur, and consequently the skins are only of trifling value. On the British coasts the chase of this Seal is of little more than sporting importance, and chiefly attractive for the skill necessitated in shooting a creature that



COMMON SEALS

exposes only a little of its person above the surface for a few seconds at a time.

A number of men went out in a boat to the Sound of Achill to capture a Seal and her young one, which were reposing upon the sand. They secured the cub before it could reach the sea, and tossed it into the boat. The mother Seal followed in the hope of rescuing her offspring. Presently she was shot in the head, and lifted into the boat. It appeared that she was only stunned, and, recovering her senses, commenced a most furious attack upon her enemies. She floundered about the boat, threatening every moment to capsize it, snapping fiercely at the legs of her antagonists, and biting the oars with which the men attempted to defend themselves. If assistance had not speedily arrived, an adventure bordering upon the ludicrous in some respects would have terminated in a tragedy.

The Common Seal is easily tamed, and becomes strongly attached

to its human friends. A cub, a fortnight old, was presented to a boy by some fishermen. In a few weeks it was perfectly domesticated, and would nestle close to the dogs in front of the kitchen fire. When it grew older it became difficult to supply it with sufficient of its natural food, and it was rowed out a couple of miles to sea, and dropped overboard. Instead of evincing pleasure at being restored to its natural element, the Seal swam after the boat, crying so pitifully that it was taken aboard and brought back to the home and friends to which it had become attached. This is by no means an isolated case. In another instance a Seal was taken out to sea several times, and unfailingly returned to its home ashore; and even when cruel curiosity prompted its owners to blind it, the sightless seal struggled back home at the end of eight days.

VARIOUS EARLESS SEALS

The Greenland Seal (*Phoca grænländica*) varies considerably in coloration between infancy and maturity, and in consequence is known under various names in different regions. The adult male seldom exceeds six feet in length. It is mainly yellowish white, the forepart of the head is black, and there are two broad semi-circular bands of deep black, extending from the shoulders nearly to the root of the tail; this latter marking gains for the animal the names 'Saddle-back' and 'Harp.' Its habitat covers the Atlantic from Newfoundland to the North Sea, and thence northwards to the Arctic regions, being particularly numerous upon the coasts of Greenland. This species is very gregarious, assembling in immense herds, which make long migrations southwards in winter. In Greenland the annual catch is very heavy; and when sealing was more common, a single European sealing-party has captured 20,000 within a week. The coast of Newfoundland is a notable breeding-ground, and the sealing industry is still important, though the annual catch now never numbers 500,000 as was formerly the case. Large numbers of the animals are shot or harpooned; but where they congregate in great force on the ice floes, clubbing is the method employed, and over 10,000 have been slain in one night. In addition to the oil that is obtained, all Sealskins make serviceable shoe leather, and 'porpoise-hide' boots are more often than not the skin of a Hair Seal.

Seals are also found in some inland waters. The Baikal Seal (*P. sibirica*) has a freshwater habitat, but the Caspian Seal (*P. caspica*) enjoys water that is only slightly salt. The origin of these species probably dates back to the remote period when these large inland seas were connected with the ocean. Nets are usually employed to catch Seals in Lake Baikal and the Caspian Sea. In Scandinavia the rocks to which Seals resort are surrounded by lines armed with large hooks, and when the Seals take fright and dive into the water, some of them at least fail to escape the trap.

The Grey Seal (*Halichærus grypus*) of the North Atlantic frequents the European side of the ocean more than the American. It attains a length of eight feet, and one which was shot on the coast of Ireland weighed eight hundred pounds. It is a particularly wary creature. It is in the habit of basking in the sunshine upon rocky ledges ; but it takes care to select a spot from which it can slide steeply into the water at the least sign of danger.

The Crested Seal (*Cystophora cristata*) has a remarkable protuberance upon the top of its head, a hood-like development of the nostrils, which its owner can inflate or collapse at its pleasure. Though it is comparatively easy to stun any Seal, the animal is very tenacious of life ; and in the case of the Hooded or Bladder-nosed Seal, as it is also called, its air-filled helmet deadens the force of a blow aimed at its nose. This spotted Seal is the fiercest of the whole family, and is particularly bold in defence of its young. The Eskimo in his frail *kayak* often gets worsted in an encounter, owing to the inflated sac rendering the animal more difficult to kill than other less protected species. The Crested Seal is nowhere numerous, and the small family parties frequent drift ice rather than shores. The Gulf of St. Lawrence is one of its favourite haunts.

The Monk Seal (*Monachus albiventer*) and the West Indian Seal (*M. tropicalis*) are the only two species that prefer the waters of the warmer latitudes ; the former is often found in the Mediterranean or Black Seas, and the habitat of the latter is signified by its name.

The Leopard Seal (*Ogmorhinus leptonyx*) is one of four species that frequent the southern, temperate, and Antarctic seas. It is a cat-like marine mammal, about which very little is known, and the southern sealing industry is now practically dead. Sir Ernest Shackleton, in his expedition to the South Pole, secured several specimens. The short, glossy but stiff fur is silvery grey in colour, spotted with yellowish white and darker grey. A full-grown male measures twelve feet in length.

THE ELEPHANT SEAL (*Macrorhinus proboscidea*)

The Elephant Seal, or Sea Elephant, is the largest of all the pinnipeds, attaining a length of quite twenty-two feet from its almost ridiculously prolonged nose to the end of its tail flippers, and consequently it is no cause for wonder that one animal should yield over two hundred gallons of oil, and its large hide is correspondingly valuable. The hair of the male is usually bluish grey, deepening into dark brown ; the female is darker.

The matrimonial alliances of the Elephant Seals, as with various other species, are conducted on the principle that the strongest males make their choice among the opposite sex, the weakest taking those that are rejected by the conquerors, or none at all, as the case may be. During the season of courtship the males fight desperately with each other, inflicting fearful wounds with

their tusk-like teeth, with which they can crack pebbles as though they were nut-shells. Each victorious combatant selects a considerable number of females, over whom he rules with despotic sway. He is very careful of their safety, and refuses to quit them if they are in danger. Sealers take advantage of this fact, and in capturing the animals first attack the females, who would immediately disperse if their lord were killed, whereas as long as he lives they will crowd around him.

Although these animals are of great bodily strength they are too apathetic to be dangerous antagonists. The sealers, armed with knives and clubs, cut off a family party's escape to the sea, and the slaughter commences. A fierce blow upon the nose will cause a huge animal to collapse like a jelly, and a slash across the throat with a knife completes the ghastly business. When the sealers have skinned their captures they are sickening studies in blood and grease, and the toilsome occupation is often marked by terrible privations incident to wild and inhospitable regions.

THE EARED SEALS (*Family Otariidæ*)

The Eared Seals possess a few distinctive characteristics. The external ear is well defined; the fore-feet more nearly approach the hind ones in length; the hind flippers are turned forwards underneath the body, and aid progress on land more than in the case of the true Seals; and all of them have distinct necks which are absent in the Seals already described. Various other features in form and habit will be gleaned from the descriptions of the two animals, that must serve for the whole family.

THE SEA LION

There are at least three species of Sea Lion, but all of similar build. Steller's Sea Lion (*Otaria stelleri*) inhabits the Behring Sea, particularly in the neighbourhood of the Pribyloff Islands, extending southwards on the Asiatic coast about as far as the Kurile Islands, and on the American shore as far south as California; but save for a 'rookery' preserved on a rocky island off San Francisco, the species has become exceedingly rare, owing to the remorseless hunting in past years, when as many as 40,000 were caught annually. It is simply a huge Hair Seal, ten feet long, with a girth varying from eight to ten feet, and scaling as much as 1200 lbs. The full-grown male is yellowish brown in colour, with darker patches between the fore-limbs, and on the underparts.

The Patagonian Sea Lion (*O. jubata*) at one time swarmed on the coasts of Peru, Chili, Argentina, Tierra del Fuego, and the Falkland Isles. It now rarely exceeds seven feet in length, but Captain Cook reported seeing some quite twice as long, and, occasionally, specimens of the Australian Sea Lion are encountered that measure twelve feet. It is the mass of stiff, curly, crisp hair

upon its neck and shoulders that earns for the southern species the name of Sea Lion, although the northern animal is destitute of a mane.

The hind flippers project nearly at right angles to the body. As the animal can raise itself upon its fore-limbs it can walk, after a cumbersome fashion, chiefly by giving pushes with its hind extremities. Its best progress is about two miles a day, but the creature will mount a steepish slope, where a man would find it difficult to retain a footing. The main food of the Sea Lion is fish,



SEA LION

crustaceans, and squids, fish being bolted whole; but failing animal substances it will eat seaweed. The Patagonian species also preys upon the ungainly, wingless penguins that frequent the same shores in large numbers. The Sea Lion often contrives to capture gulls. It exposes only the tip of its nose, upon which the gull swoops down, only to find itself the prey of a hungry carnivore.

Steller's Sea Lion congregates in the same regions as the Fur Seals during the breeding season. The males are polygamous, but restrict themselves to three or four females. They are very blatant animals, keeping up a clangorous uproar, the old animals bellowing like bulls, and the younger ones bleating very much like sheep.

The hides, flesh, and fat are extremely useful to the natives, whether in the north or south. So long as the slaughter of the animals was confined to the methods of the natives, who use poisoned arrows or harpoons, the Sea Lions were never in danger of extinction. But when European whalers turned their attention to hides and oil, their wholesale methods of capture rapidly reduced the animals. The specimens kept at the Zoological Gardens are usually of the Patagonian species, such as that depicted in the accompanying photograph.

THE SEA BEAR (*Otaria ursina*)

Several species of the southern Fur Seals have become nearly, if not quite, extinct, as the result of continual hunting; but the Northern Fur Seal, or Sea Bear, still survives in considerable numbers in the Behring Sea. When full grown, the male is about six feet in length and weighs 600 lbs.; the female is smaller, and sometimes only turns the scale at eighty pounds. The colour of its fur is very pleasing, the long hairs being of a greyish brown, while the thick, soft wool that is next to the skin is reddish brown. The fur is extremely soft and warm, and of high value as an article of commerce. When it is dressed by the furriers, the entire coating of long hairs is removed, the wool only being left adherent to the skin. This is easily accomplished by shaving away the inner layer of the skin which contains the roots of the longer hairs. The animal is not so easily caught as the sea lion, for it is not only very active in the water, but can proceed upon land with such rapidity that a man who wishes to overtake an affrighted animal will be forced to exert his utmost speed.

In the breeding season great numbers of Sea Bears resort to the shores of Kamtschatka, the Pribyloff and Kurile Islands, and other lonely spots in the North Pacific. The males arrive early in May, the females a few weeks later. Each male has already selected a spot for his special domain to which he now escorts as many females as he can wrest from his fellows, incidentally the poor wives suffering no little mauling in the process. As the number of females over which a single male rules is on an average about forty to fifty, the family is a considerable one when it is reinforced by the young Sea Bears.

No family will allow any of another household to encroach upon its particular location. When trespassing is detected it will often lead to a general fight upon the beach in which both sexes of all ages fight furiously, using their teeth and the sharp claws with which the limbs are furnished. They will advance upon a human being with a menacing display of gleaming teeth. One traveller was so hard beset by these animals that he was forced to climb a rock which they could not surmount, where he had to remain for six hours before he could effect his escape.

The males are very tyrannous to their wives, and treat the submissive creatures very cruelly. It is not the least strange thing in the animal world that young Seals have to be taught to swim by their mothers, which appears to suggest that the Seals were land carnivores until comparatively modern times. It is still more remarkable that during the two months of the breeding season the Seals do not eat, although normally a bull will dispose of a hundredweight of fish a day. The pups grow amazingly fat upon their mothers' milk, but after they are weaned, they, too, appear to fast until the whole colony is disbanded, and goes to sea.

But for government intervention, securing a close time for the Seals, and limiting the number to be killed in particular regions, the Northern Sea Bear would have been perilously near extinction. It is stated that revolting cruelties are practised in the procuring of sealskin. "The slaughter and skinning of Seals," says Captain Borchgrevink, "is unnecessarily barbarous and hideous. Specially cruel is the task when seal-pikes are used. Only rarely does an animal die from one or two blows of a pike, and if it is not dead it is generally considered 'all the better,' for it is easier to skin a Seal while it is half alive. In the utmost agony the wretched beast draws its muscles away from the sharp steel, which tears away its skin, and thus assists in parting with its own coat."

Driving Seals overland is scarcely less repulsive. These highly sensitive and intelligent animals are forced onward, panting and helpless, over rough and stony ground which it is a torture to traverse. When they reach the killing-grounds alert Indians crack the skulls of those that are required. "The crash of the skull, the flow of blood, the sobs of the dying, and the brutality of the heartless and careless men are awful." It is regrettable to think that a beautiful sealskin garment is only procured at the cost of such unutterable agony to a harmless and defenceless animal.

FAMILY: TRICHECHIDÆ

THE WALRUS (*Trichechus rosmarus*)

The Walrus, Morse or Sea Horse, is a monster of the deep that stands in a category of its own. Its most striking feature is its head, with its protuberant muzzle bristling with long, wiry hairs, and a couple of enormous canine teeth that project from the upper jaw. Fine tusks attain a length of two feet with a girth at their base of seven inches, and the weight of each varying from four to ten pounds. The tusks are used for raking up molluscs out of the mud, and they form excellent grappling-hooks, by means of which to climb out of the water on to the ice. The ivory is not nearly of so fine a quality as that of the elephant.

Twelve feet is not an uncommon length for a full-grown Walrus, but reports of twenty-feet animals are usually quite unauthen-

ticated ; the girth averages from ten to twelve feet, and the total weight often exceeds a ton. The skin is black, and folded and wrinkled, especially on the shoulders, and the whole is sparingly covered with brown hair, except in old age, when the skin is nearly naked.

A Walrus is rather a valuable animal, for even in this country its skin, teeth, and oil are in much request. The oil is not so good as that of the majority of seals, and the animal yields much less in proportion to its size. Among the Eskimo the Walrus is put to a variety of uses. Fish-hooks are made from its tusks, the intestines are twisted into nets, its oil and flesh are eaten, and its bones and skin are also turned to account by these rude but ingenious workmen.



YOUNG WALRUS

The Walrus is practically confined to the Arctic regions, but a stray animal sometimes finds its way to the north of Scotland. Remains dug up at Ely indicate that in early periods the animal ascended rivers. About fifty years ago, when whaling became less profitable, the whalers commenced to devote attention to the Walrus, and very speedily they depleted the innumerable herds, especially in the Behring Sea regions. In ten years quite 100,000 Walruses must have been destroyed, for the total catch for that period alone totalled about two million gallons of oil and 400,000 lbs. of ivory. Russian Walrus hunters have obtained in a single year nearly 30,000 lbs. of ivory from the Pribyloff Islands.

In the more remote sub-Arctic regions the animal is still fairly abundant, congregating in considerable herds. A gathering of

these clumsy animals presents a curious sight ; they are ever in movement, tumbling over each other, and constantly uttering their hoarse bellowings.

The movements of the Walrus when on land are of a very awkward character, for its limbs are insufficient to urge the unwieldy, weighty body forward with any speed ; yet when the creature is alarmed it gets over the ground by a mixture of jerks and leaps at a faster pace than one would expect. Should it be attacked, and its retreat cut off, the Walrus advances fiercely upon its enemy, striking from side to side with its tusks, and endeavouring to force a passage into the sea.

The Walrus, by the time it is two years old, has tusks only one or two inches long, and quite insufficient to obtain the requisite amount of food. Thus the patient dam suckles her young, until, in the case of the male, it is as big as its mother. On this account the animal is supposed to breed only at intervals of two or three years. Like the other pinnipeds, the Walrus only gives birth to a single young one, which, in its infancy, the mother clasps with the fore-limbs.

ORDER: RODENTIA

THE GNAWING ANIMALS

The Rodents, or gnawing animals, are marked by the peculiar construction of their teeth, specially adapted to making inroads upon hard substances. The jaws are heavy and large in proportion to the size of the head, for not only have they to support the gnawing teeth, but to allow for their continual development. There are no canines, and the molars and incisors are separated by a wide gap. The incisor teeth, with their chisel-like edges, are very destructive, and in many respects are entirely wonderful. Subjected to continual friction they would wear away, and leave their owner without the means of subsistence unless nature obviated such a calamity. The teeth are kept nourished by a pulpy substance which adds fresh material to keep pace with the daily waste. This constant growth is easily perceived if a rodent happen to break one of its incisors. Having no tooth to oppose it, the uninjured opposite tooth will grow to an enormous length, sometimes forming a complete circle ; and such malformed teeth often cause the death of an animal by preventing the use of all the other teeth. The enamel on the front face of the incisor teeth is much harder than that upon the remaining surfaces, and the dentine composing the solid mass of each tooth is likewise harder in front than behind. The softer enamel and dentine wearing away much quicker than the front surfaces, preserves the sharp chisel-like edge. Metal chisels are made upon the same principle as rodent incisors, viz., a thin plate of steel with a backing of softer iron.

The Rodents are spread over the entire globe, some, indeed, are quite cosmopolitan ; they are very numerous, and comprise not far short of one-third of the Mammalia. Most of them are small individually, but they are wonderfully prolific, and in some regions exist in vast multitudes. Though mainly vegetable feeders, some species are omnivorous, and many of them are particularly destructive to growing crops and stores of grain. The greater proportion of the Rodents are fit for human food, although in our country only the rabbit and hare come within this category, but in other regions, notably China, even rats and mice are viewed with marked favour. It should be borne in mind that there is scarcely any creature that walks, crawls, creeps, swims, or flies that is not accepted as food in some part of the world ; and meat that one people would view with loathing is held in high esteem by another.

FAMILY : SCIURIDÆ

THE SQUIRREL (*Sciurus vulgaris*)

There are numerous species in this family, and, save in colouring and various other trifling distinctions, the lively English Red Squirrel is fairly typical of many of them. It ranges over the greater part of Europe, and Northern and Central Asia. Usually it is a ruddy brown upon the back, and greyish white on the under portions of the body. The

tint of its fur, however, is very variable in different countries ; in England it changes almost to grey during a severe winter, and in Siberia it is a bluish grey all the year round. The feathery tufts



ENGLISH SQUIRREL

of hair which adorn the ears are always longer and fuller in cold regions, and in our own country are almost entirely lost during the hot summer months.

This active little creature is a great favourite in English woods and copses, and for its gambols and antics it is allowed to wander about unchecked and unharmed. Its sprightliness and sureness of foot

among the branches are absolutely surprising. On the ground its gait is a semi-gallop, and it is by this mode of movement that it quickly ascends a tree trunk. So agile is it, and so adept at guarding itself by the interposition of branches, that it is difficult to shoot one after it has become aware of the presence of the enemy.

The Squirrel is seen searching for the seeds and fruits upon which it feeds chiefly in the early morning, or in the cooler hours of the afternoon. The hotter portion of the day it spends in its admirably constructed nest high up in the fork of a lofty branch, or sometimes concealed in the hollow of a decayed bough. The nest is nearly spherical, composed of leaves, twigs, moss, and grass, artistically woven in such a manner that it is not easily dislodged by a violent wind, nor is it permeable to rain. Not only will a pair of Squirrels inhabit the same tree, but they will occupy the same nest year after year.

Though a hibernating creature, the Squirrel winters in a much more conscious way than the bat, or even the hedgehog. Towards the end of autumn it exhibits a true spirit of providence in gathering acorns and nuts, which are treasured up in all kinds of holes and crevices near the tree in which it dwells. Whenever the Squirrel requires nourishment, even though snow be on the ground, it scratches away the snow, and unerringly recovers its hidden treasure.

THE GREY SQUIRREL (*Sciurus carolinensis*)

There are several species of Squirrel in Canada and the United



GREY SQUIRREL

States, of which the Grey, the Red (*Sciurus hudsonius*) and the Black Squirrel (*Sciurus niger*) are the chief. The American Red Squirrel is not the same species as the similarly coloured European animal. The Black Squirrel is three feet in length from the tip of its nose to the end of its bushy tail. The Grey Squirrel is smaller, but it is a pugnacious little creature that in many regions has supplanted its bigger relatives. Some of these animals have been set at liberty in the Zoological Gardens. Though they enjoy the utmost freedom they have lost much of their

natural timidity, and will readily take nuts from the hands of visitors. They are now not only thoroughly at home in Regent's Park, in or out of the Gardens, but they have spread to other wooded districts of Middlesex, and complaints are being made that they are ousting the Red Squirrel from its native haunts.

In some regions of North America the Grey Squirrel formerly existed in such immense numbers as to become a positive plague. In Pennsylvania it was necessary to offer a reward of threepence a head for every rodent destroyed; and sometimes half a million were paid for in the course of a year. A horde of migrating Squirrels nowadays would be viewed as less of a pest, for in all probability the increased value of the fur would more than compensate for the damage they would cause to growing crops.

If any of the foregoing squirrels lose their foothold when darting about the branches of trees they are not at all disconcerted; they spread out their legs and bushy tail, presenting a large surface to the air, and come quite lightly to the earth.

In the Flying Squirrels, however, the skin of the flanks is modified in a manner similar to that which has already been noticed in the Cobego. This skin is so largely developed that when the animal is sitting at its ease, its paws only just show from under the soft folds of the delicate, fur-clad membrane. When the creature makes one of its marvellous leaps, it stretches its four limbs to their fullest extent, and is upborne through the air on the parachute-like expansion. The Taguan (*Pteromys petaurista*) of India, the Assapan (*Sciuropterus volucella*) of America, and the Polatouche (*S. volans*) of Siberia are the best-known examples of the Flying Squirrels. It is a particularly pleasing sight to see a number of sociable Assapans engaging in their feats of flying gymnastics, whereas the other species are rather lonely animals, and seldom seen more than a pair at a time.

THE CHIPMUNK (*Tamias striatus*)

Of various ground-squirrels the Chipmunk is one of the best known. It differs chiefly from its arboreal relations, the true squirrels, in the possession of cheek pouches. Though primarily it is a burrower, the Hackee, or Chipping Squirrel as it is also called, is a brisk and lively little quadruped that whisks about brushwood with remarkable celerity. It is about eleven inches in length; it is brownish grey on the back, warming into orange-brown on the forehead and the hinder quarters, with longitudinal, black and yellowish-white stripes upon its sides. If the animal were not so common its elegant fur would be much more highly esteemed.

The Chipmunk's retreat consists of a principal winding burrow, and several supplementary tunnels, in which it lays up a stock of provisions for the winter. One store has been found to consist of

“ a gill of wheat in the nest, but in the galleries was obtained about a quart of hazel nuts, nearly a peck of acorns, two quarts of buck-wheat, and a small quantity of grass seeds.” When the little creature is packing away its winter store it always carries four nuts on each journey, and with its cheek pouches distended to their fullest extent it presents a most ludicrous aspect.

THE ALPINE MARMOT (*Arctomys marmotta*)

The Alpine Marmot is about the size of a rabbit, and is clothed with greyish-yellow fur, deepening into darker grey on the top of the head, and into black at the extremity of the tail. It lives in small societies in various mountain regions of Europe, especially the Alps, Carpathians, and Pyrenees, and is the only European mammal that permanently resides in close proximity to perpetual snow.

The Marmot is an expert excavator, and digs rather complicated burrows, always reserving one chamber in which to store dried grass and other vegetable food for use during the winter. The animal retires about the middle of September, closes up the burrow with grass and earth, and occupies the earlier portion of its retirement in eating up the store of food. It then enters into a lethargic state, in which the action of the heart and lungs is almost entirely suspended until the beginning of April. When it retires, the Marmot, like other hibernating animals, is exceedingly fat, and its fur is then in the best condition. It is at this period that the inhabitants of the mountain regions dig into the burrows to capture the animal for its flesh and fur.

The Marmot is exceedingly wary. When a sentinel gives the alarm cry every animal scuttles into its subterranean home. They quickly reappear to verify the danger, and a second alarm will cause the whole colony to remain in hiding for the remainder of the day. When taken young the animal is easily tamed, and was formerly the frequent companion of Savoyard beggars. There are other species of true Marmot very similar in appearance and habits.

THE PRAIRIE MARMOT (*Cynomys ludovicianus*)

The Prairie Marmot is more often styled the ‘Prairie Dog,’ which title is gained from the sharp yelping sound which it utters when alarmed, accompanying each cry with a smart jerk of the tail. It appears to be a link between the ground squirrels and the true Marmots. It is a gregarious animal, found in immense numbers in the Missouri region of North America. It is about sixteen inches in length, and in colour is mainly reddish brown, mixed with grey and black ; its incisor teeth are large and protrude from the mouth.

The warrens of a colony of Prairie Marmots form what is called

a 'Dog town,' and the affairs of the community are regulated by a single leader, the 'Big Dog.' In front of every burrow is a little mound of earth, which is generally occupied as a seat by the burrower. The moment danger is apprehended a sharp yelp is the signal for retreat. Quick barks resound on every side, there is a cloud of dust, a whirl of flourishing legs and whisking tails, and the whole spot is apparently deserted. In a few minutes, however, eyes are gleaming and teeth glistening at the entrance of each burrow, and if it prove to be a false alarm the community is speedily again in lively action. A 'Dog town' is often the resort of unwelcome and alien visitors, especially the burrowing owl and the rattlesnake. At one time it was believed that these creatures were upon amiable terms with the inhabitants of the interminable burrows, but it is now certain that they subsist upon the young Prairie Dogs.



PRAIRIE MARMOT

FAMILY: CASTORIDÆ

THE BEAVER (*Castor fiber*)

The Beaver, one of the larger rodents, is an aquatic animal that is found in the northern parts of both hemispheres, but especially in North America. At one time it was common in Europe from Wales to the Ural Mountains, and it certainly existed in the River Thames; but nowadays it would be extinct in Europe but for a few animals preserved in Scandinavia and Poland.

The colour of the long shining hairs which cover the back of the Beaver is a chestnut-brown, and the fine wool that lies next to the skin is a soft, greyish brown. The total length of the animal is only three feet and a half; the flat, paddle-shaped, scale-covered tail is about one foot in length; the legs are short and strong, and the hind feet are webbed. The teeth are wonderfully powerful and sharp, and the jaws are possessed of singular strength.

The Beaver lives in societies, and in the construction of engineering works displays a remarkable admixture of reason and

instinct. So that they may have a sufficient depth of water in all weathers and at all seasons, the Beavers build dams in order to raise the water to the necessary level. A dam is composed of the branches of trees, mud, and stones, ten to twelve feet in thickness at the bottom, and narrowing to a couple of feet at the top. A gentle stream will have a straight dam across it, but to meet a swift current the structure is curved so as to present a convex surface to the force of the water.

By means of its sharp cutting teeth, the animal experiences no difficulty in gnawing through the trunks of trees eighteen inches in diameter, which it strips of branches, and cuts up into logs of several feet in length. In forming the dam the ends of the stakes are not thrust into the river-bed, but are laid down horizontally, and kept in position by the weight of the mud and stones that are heaped upon them. As a dam is sometimes three hundred feet in length, an immense number of logs is required, and a colony of Beavers makes considerable inroads upon the timber in the neighbourhood of their home. The bark of the fallen trees is generally separated from the logs and forms the store of winter food.

Near the dams are built the Beaver houses or 'lodges,' chiefly consisting of branches, moss, and mud, and each large enough to accommodate half a dozen animals. A lodge is a dome-like structure, fifteen to twenty feet in diameter, and seven or eight feet in height; but the walls are of such thickness that the living-room only consists of a space about seven feet in diameter by three feet in height. The roofs are covered with a layer of mud laid on with marvellous smoothness, and carefully renewed every year. It was once popularly supposed that the animal used its flat tail as a trowel, but the plastering is done with its fore-feet, the tail being used only as a rudder in swimming. The lodges open into a ditch that is too deep to be frozen, and the Beavers thus are enabled to pass in and out under the water without hindrance. The rodent engineer is a poor pedestrian, and on land falls an easy prey to the voracious wolverene; but in winter the compost of which the lodges are formed freezes into a solid mass, that defies the sharp claws of the savage carnivore, which cannot force a way in to its prey.

All Beavers do not engage in dam construction, some contenting themselves with excavating long tunnels, in which to take up their abode. These drones are always males, and in all probability are the animals which have been worsted in the fierce fights which take place among the males for mates. Trappers find it rather an easy matter to capture these ostracised animals, which is by no means the case with the Beavers that seek shelter in a dammed-up stream.

Beavers secrete an odoriferous substance called 'castoreum' in two glandular sacs near the root of the tail. All the animals are strangely attracted by the powerful odour, and if their nostrils perceive its distant scent, they will sniff about in all directions,

and absolutely squeal with excitement. The hunter takes advantage of this curious propensity in setting his traps. The snare is laid about six inches under the water, and above is floated a twig, which has been dipped in castoreum. Any young Beaver which scents the bait will come to it, and probably fall an easy captive; but an old and experienced animal is more wary, and will heap mud and stones upon the trap, and render it useless, before depositing upon it its own superabundant castoreum. This substance the trappers call 'barkstone'; it was formerly in considerable request for medicinal purposes, but is now restricted to employment in perfumery. In the United States the Beaver has been hunted to the verge of extermination, except in the remoter west, and in Canada only a few thousand animals fall to the trappers in the course of a year, whereas formerly over a hundred thousand skins would be exported from Quebec alone. The fur is still valuable, though silk has supplanted its use for the once popular 'beaver hats.' In the Canadian national shield the Beaver figures as an emblem of sagacity and industry, and if only for its exhibition of these excellent qualities, it would be a pity for it to be hunted to vanishing-point.

FAMILY : DIPODIDÆ

THE JERBOA (*Dipus ægyptiacus*)

There are various kangaroo-like little animals, of which the common Jerboa is perhaps the best type. It ranges over a rather wide area, including South-eastern Europe, Northern Africa, Syria, Arabia, Central Asia, India, and Ceylon. It is a beautiful and active little creature, scarcely larger in body than an ordinary English rat, but its peculiar attitude, erected on its long hind legs, and its extremely long tail, give it an appearance of greater dimensions than it really possesses.

The general colour of its fur is a light dun washed with yellow,

the abdomen being little removed from white. For progression only the hinder limbs are used, the forefeet being pressed closely to the breast while



JERBOA

the creature is flying through mid-air in a series of extraordinary leaps. The tufted tail is specially useful in preserving the proper balance of the body while the Jerboa is scouring over the ground at a speed that tries even the best-trained greyhound.

The Jerboa is a burrowing animal, living in communities in dry and sandy spots, where large warrens are constructed. It basks in the sun or gambols with companions near the entrances to the burrows, but it is chiefly a nocturnal animal, feeding only by night. Its flesh is not at all palatable, but in some very arid regions it is the best that the natives can procure, and consequently the Jerboa warrens are systematically raided. Many of the entrances are closed up, and the creatures are killed as they seek to effect their escape.

A very similar species is the Cape Jumping Hare (*Pedetes caffer*) which, but for its shorter ears and elongated hind legs, is not unlike our common hare. In full flight it makes remarkable bounds of twenty or thirty feet, but it is seldom seen in daylight, making nocturnal raids on the natives' cornfields and gardens, and returning to its subterranean home before sunrise. When the natives desire to capture the animal, they pour water into the burrow, and strike down the fugitive as it rushes into the open air.

FAMILY: MURIDÆ

The Muridæ is the largest family of the Rodents, including the mice and rats and many other animals related to them. Among them are the tiniest of the mammals, and even the largest are insignificant in size; but some of the species multiply to such a prodigious extent that their influence upon human affairs is a matter of grave concern. Though there are about three hundred and thirty species of mouse-like rodents, a selected few will serve to describe the main characteristics of the whole family.

THE HOUSE MOUSE (*Mus musculus*)

The common Mouse is a pretty little creature with its brownish-grey back, grey underparts, soft, velvety fur, its tiny, black, bead-like eyes, and squirrel-like claws. It is so familiar an animal that its habits and manners call for only the briefest reference. It frequents both town and country, and is absolutely cosmopolitan. It is capable of much annoyance to human beings through its pertinacity in taking up its residence in close proximity to stores of food. It is to mice and rats that the cat owes its place as a domestic animal. In ancient Egypt, which was the granary of the then known world, it was imperatively necessary to keep these little pests within reasonable limits, and the cat became so valuable as to be invested with the attributes of sanctity, and he who killed one forfeited his life. The Mouse is astonishingly prolific, producing

young at a very early age, and several times in the course of a year. The nests are made in any sheltered spot, and are formed of soft substances, such as rags, paper, wool, etc.

Mice are very easily tamed, and there are numerous varieties of fancy animals, brown, white, black, or with curiously pied coats, that are very popular pets. If any of these creatures are allowed their liberty for only a short time they mingle with their common wild relations, and promptly cease to be susceptible to human influence.

THE HARVEST MOUSE (*Mus minutis*)

The Harvest Mouse, though not the smallest, is the prettiest of the British mammals. Including the tail the total length of the tiny creature is not quite five inches. The colour of its fur is a delicate reddish brown with the underparts white, the line of demarcation being well defined. Apart from size, the Harvest Mouse may be distinguished from an ordinary mouse by its short ears, narrow head, slender body, and less projecting eyes.

This Mouse constructs a wonderful nest upon a scaffolding of several rank grass or grain stalks. In form it is globular, about the size of a cricket ball, and composed of thin, dry grass of nearly uniform substance, and sufficiently loose for any object it contains to be seen through the interstices. There is no vestige of aperture in any part of it, which suggests that the little builder weaves it from the inside, and then, pushing her way out through the loosely woven wall, rearranges the gap from the outside. In all probability the nest is the joint work of both sexes, the female plaiting within while her mate brings fresh material and consolidates the work from the outside. It is an interesting problem how the young mice are fed while snugly packed in their airy cradle. It is supposed that the mother makes temporary openings so as to present a teat to each of her little ones. It is certain that the nest must expand so as to accommodate itself to the increasing dimensions of the family; in doing this, the home does not lose its spherical shape, and always it can be rolled about without displacing its living contents. The Harvest Mouse is very destructive to corn, not only in the crop, but also when in store. In winter it hibernates in its burrow, unless it happen to find quarters in a rick or barn, when the abundance of food removes any necessity for torpor.

THE RATS

Few animals are so well known and so cordially detested as the Rats, which in build so much resemble mice as to be placed in the same genus; they are, however, considerably larger, and for their size are dangerous animals, able to inflict very painful wounds with their long incisor teeth.

Until about two centuries ago the Black Rat (*Mus rattus*) was the only species known in the United Kingdom, and it was common in most parts of Europe. It derives its name from the colour of its fur, which is greyish black above and a lighter shade beneath.



BLACK RAT

The Brown Rat, a larger and fiercer animal, is a native of China that has gradually worked its way westwards, and immense numbers certainly passed over the Volga in the year 1727. Wherever the Brown Rat sets its feet it takes up its abode, and soon establishes itself in perpetuity. The terrible rate at which it increases explains the slow process of extermination despite the vast sums expended. It has been calculated that two Rats, if left unchecked, would in the course of three or four years multiply into twenty millions of rodents. The Norwegian Rat, as it is sometimes called, under the mistaken idea that it came to us from that country by way of shipping, has practically exterminated its black brethren in our country. It is a truly formidable animal, sometimes attaining a length of twenty-two inches, and a weight of four pounds; it is capable of beating a ferret in fair fight, and a large body of them, driven by hunger, have been known to make short work of a man.

The Rat's bill of fare comprehends everything that man eats and a thousand things besides, and the commodities which it damages or spoils far exceed in value what it eats. It undermines the foundations of buildings, damages quays and sea promenades, destroys books, leather goods, and textile materials, steals eggs, and kills chickens and pigeons. The raiding of hen-roosts, which is often attributed to the fox or weasel, is more often than not the work of foraging Rats. It is an exceedingly voracious creature, not sparing its own species in times of scarcity, and a wounded Rat is always devoured by its companions. The farmer, butcher, sailor, provision merchant, or poultry keeper need to exercise the most elaborate precautions to cope with the perpetual hunger, craft, and daring of the Rat. Cereals are its diet from preference. It works enormous havoc in corn ricks, and contrives it with such secrecy that the stacks appear to be unharmed until threshing time reveals its serious depredations.

It is computed that there are forty million Rats in our country,

and that each individual does one farthing's worth of damage every day, or a total loss to the country of £15,000,000 per annum. Economic loss through the destruction of food and material does not mark the full iniquity of the detestable creature. By burrowing and piercing soil, pipes, etc., it allows the influx of dangerous sewage gas into dwellings, and in collieries its tunnelling disarranges the ventilating system, and endangers the lives of miners. More than this, scientific investigations prove that it is the means of spreading trichinosis in Europe, and bubonic plague in the East. The fleas which infest the fur of the rodents desert a plague-stricken Rat as soon as it is dead, and then human beings and domestic animals are liable to be bitten and infected with disease bacilli. If only because it is a fertile disseminator of disease modern civilisation demands the extermination of the Rat, and scientists are evolving schemes to deal with a pest that within the space of a couple of centuries has overrun the world.

THE SHORT-TAILED FIELD MOUSE (*Arvicola agrestis*).

The Short-tailed Field Mouse, or Field Vole, is a wonderfully prolific little rodent that multiplies into incredible numbers if no



FIELD VOLE

steps are taken for its destruction. The total length of the creature is only five inches, of which the tail is an inch and a quarter; it is ruddy brown on the upper portions of the body, and grey on the abdomen and chest. It is a water-loving animal, and prefers low-lying, damp meadows rather than the drier uplands. It is even more destructive

in the open meadows than is the common grey mouse in barns or ricks. It burrows beneath the ground at sowing time, and devours the seed wheat which has just been laid in the earth; it plunders the ripened crops in the autumn; and by dint of its multitudinous numbers makes considerable inroads into ricks and grain stored in barns. In woods and plantations it not only damages the bark of young trees, but in its continual burrowing it nibbles the roots of living trees and shrubs, which in consequence wither and die. The weasel tribe, owls, hawks, and magpies prey upon the Field Vole, but nevertheless in some regions, at irregular intervals, the little rodents swarm in incredible numbers,

and drive agriculturists to the verge of distraction. In one such visitation in the Crown plantations in Gloucestershire and Hampshire, it was found that the Voles were eating through the roots of five-year-old oaks and chestnuts; and hollies five and six feet high were barked round the bottom, and in some instances the pertinacious creatures were even eating the bark on the upper branches. In one Department in France the farmers ridded their fields of a plague only at a cost of £70,000. Quite recently in Nevada, U.S.A., certain plains were literally infested with what was called the Meadow Mouse, and eventually the vegetation was destroyed upon farms that covered forty-five square miles. Government naturalists at last suggested a remedy. Tons of chopped hay, saturated with strychnine and water of insufficient strength to harm farm animals, were strewn upon the ground in front of the advancing armies of mice. This gigantic mousetrap proved successful, millions of the little animals were killed, and the plague abated.

THE WATER VOLE (*Arvicola amphibius*)

The Water Vole is often wrongly termed the Water Rat. It is the largest of the British Voles, measuring about nine inches in length without the tail of four and a half inches. It not only has a shorter tail than the brown rat, but it is snub-nosed, and its incisor teeth are of a light yellow colour. Its fur is chestnut-brown dashed with grey above, and lighter beneath. It frequents streams or ponds, making its burrows on the banks and feeding chiefly on water plants, roots, seeds, bark, etc. This Vole, which is really allied to the Beaver, is often saddled with a bad reputation through its unfortunate resemblance to another animal of evil character. The Water Vole will find its way into gardens and damage cultivated vegetables, but it does not prey on chickens and ducklings, nor does it capture fish. In the summer the town rat often migrates to the countryside to indulge in a series of poaching exploits, preying upon fur, fish, and feather to satisfy its voracious appetite.

THE MUSQUASH (*Fiber zibethicus*)

The Musquash, Musk Rat, or Ondatra resembles a big water vole in general appearance. It is about a foot in length, with a scaly tail of ten inches. The fur on the upper part of its body is dark brown, with a tinge of red upon the neck, ribs, and legs, the abdomen being ashy grey. Its hinder feet are well webbed, and their imprint on soft mud much resembles that of a common duck. It lives mostly in burrows in river banks, but in marshes it often builds little lodges that rise three or four feet above the water. There are usually several entrances to its home, and all of them under water, and the dwelling-chamber may be twenty yards from the entrance. Living in small communities, the animal is social and playful, and will make no offensive use of its teeth even when

handled by man for the first time. The flesh of the Ondatra, though it has a strong, musky odour, is a favourite dish with the Red Indians, and some white people consider it equal to wild duck. Its fur is valuable, and in common with other mammals whose coats are of commercial value, it is now found in ever decreasing numbers. Its range formerly extended in North America from the Atlantic to the Pacific, and from the Arctic regions as far south as Texas ; it has now disappeared from the settled districts, and is found chiefly in the lonely north. Apart from its human enemies, the



MUSQUASH

Musquash is well able to take care of itself. A few years ago several animals were turned loose in Argyleshire, where they evidently thrived. Several seasons elapsed, and then the creature was observed at several points far removed ; one strayed into a farmhouse, and another was killed by a boatman while it was swimming across Oban harbour. As there are from five to nine young ones at a birth, and often more than one litter in a year, it is highly probable that the Musquash will contrive to exist in Scotland.

THE HAMSTER (*Cricetus frumentarius*)

The Hamster is widely spread over many parts of Northern Europe. It is just under a foot in length with a tail three inches

long. The colour of its fur is greyish fawn on the back, deepening into black on the underparts. The head and face are almost yellow, and the shoulders and sides are patched with whitish yellow.

The burrow of the Hamster is deep and complicated, consisting



HAMSTER

of horizontal passages connecting several rather large chambers, in one of which the animal lives, while the others are merely store-rooms. At all seasons the Hamster is most destructive to crops of corn, peas, or beans, and with the approach of autumn it commences to lay up a winter store in a most systematic manner. It fills its cheek pouches with grain, and carries its plunder to its subterranean retreat; a single animal will secrete sixty pounds of corn, and a hundred-weight of beans is no unusual hoard. Consequently, as soon as the harvest is over, the husbandmen dig up the Hamster burrows to recover the stolen grain, and at the same time large numbers of the animals are captured for the sake of their skins. In one district alone eighty thou-

sand animals have been secured in a season.

Though the Hamster chiefly exists on vegetable food it varies its diet with worms, insects, mice, small birds, lizards, frogs, etc. Its character is marked by a strange, unreasoning ferocity, and, when irritated, it will fly upon a dog, man, or horse without hesitation. If a cart happen to crush it, with its last gasp it will bite at the wheel; when threatened with a bar of nearly red-hot iron it has been known to grasp it, and retain its hold in spite of the pain. Among themselves the animals fight desperately, regardless of sex or age, and not infrequently a quarrel between a male and its mate ends in one or the other being partly eaten by the disconsolate survivor.

THE LEMMING (*Myodes lemmus*)

The Lemming is a smaller rodent than the foregoing animal, being only six inches in length, including its tail of half an inch. In colour it is chiefly dark brownish black upon the back, fading

into yellowish white upon the underparts. It is found in the northern regions of both hemispheres, but it is slightly larger in Europe than elsewhere, and in Scandinavia it is particularly plentiful. It is a vegetable feeder, and even under snow does not cease to burrow in search of lichens.

It is one of the most prolific of the Muridæ family, and at irregular intervals, without any apparent reason, will swarm in some particular region in countless millions, preparatory to an unexplainable migration to the coast. Driven onwards by some overpowering instinct, the vast hordes of rodents proceed across the country in a straight line, nothing but a perpendicular wall of rock being able to divert their course. Rivers and lakes they swim without hesitation, stacks and corn ricks they eat their way through, grass lands are utterly devastated as though visited by clouds of locusts. Even though belts of fire destroy thousands of the little creatures, they fail to stop the resistless march. The migrating hosts are followed by flocks of predaceous birds and quadrupeds that continually feast upon the Lemmings. The inhabitants of the regions concerned adopt all kinds of plans to lessen the plague, which not only entails great loss, but is often followed by a mild form of pestilence, which is known as lemming fever. Real relief only comes when the migrants have swept over the land and reached the coast, where the Lemmings press on into the sea and finally perish.

FAMILY : MYOXIDÆ

THE DORMOUSE (*Muscardinus avellanarius*)

The common Dormouse is abundant in many parts of England and the Continent, and everywhere it is in great favour as a domestic pet. It is about five inches in length, of which the tail accounts for



DORMICE

half. It is reddish brown above, and white beneath, although for the first year of its existence it is much the same colour as the common mouse; in appearance and habits it bears no small

resemblance to a small squirrel. It is a lethargic creature in the daytime, which it spends in a warm, neatly constructed nest in a thick bush or the hollow of a tree. At night, however, it leaps actively from branch to branch, darting about with such agility as to render it almost an impossibility to capture it by the human hand. It feeds chiefly upon nuts, seeds, etc., sitting up on its haunches and eating from its fore-paws like the squirrel. As with many of the hibernating animals, the Dormouse becomes exceedingly fat towards the end of the autumn, when it retires to pass away the winter months in sleep, only awaking when there is a break in the frost to partake of its stored-up food. Very often as many as a dozen nests are built in close proximity to each other. The young animals are generally three or four in number, and make their appearance at the end of spring.

The Loir (*Myotus glis*), often called the 'Fat Dormouse,' is common in Southern Europe in oak and beech forests. The general colour of its fur is grey. It often enters gardens and makes sad havoc of the choicest fruit. The Italians do not disdain to use it for food, and it was held in high favour by the old Roman epicures.

FAMILY: HYSTRICIDÆ

THE PORCUPINE (*Hystrix cristata*)

The common Porcupine is a native of Southern Europe, Northern and Western Africa, and in the south of Asia and the New World are other more or less similar species. Porcupine literally means 'spiky pig,' and the animal is furnished with an armoury of pointed spears which, it was once supposed, it launched at its foes with fatal precision. The longest quills are flexible, and not capable of doing much harm, but the shorter spines, from five to ten inches in length are more effective weapons. Their hold on the animal's skin is very slight, and when they are stuck into a foe they remain fixed in the wound with very disconcerting effect. The quill is fitted with barbed projections that will not permit it to be withdrawn easily, and every movement of the sufferer causes the weapon to burrow deeper into the flesh. Leopards and tigers frequently die after an encounter with a porcupine, for the barbs not only set up a distressing inflammation, but prevent the carnivores from securing further prey, thus causing them to die of starvation.

The Porcupine is nocturnal, and emerges from its deep burrow only in the evening in search of roots, bark, and fruits. It is not an aggressive animal, but if irritated or wounded becomes a most unpleasant antagonist. It is capable of quick movement, and bare-legged natives seeking to capture it seldom escape unscathed. Strangely enough, it makes no effort to use its sharp incisor teeth for defence, probably because its thick and heavy muzzle is particularly sensitive, and a comparatively slight blow upon the nose



PLATE VII

Beaver
Porcupine

will stun it. When molested it erects its spines, and backs towards its enemy, and it can also roll itself into a ball like the hedgehog. The total length of the common Porcupine is about three and a half feet. The quills have a commercial value, being used for fishing-floats, pen-holders, etc.

The Canadian Porcupine, Cawquaw, or Urson (*Erithizon dorsatus*), like all the New World species, is a tree climber. It is a bark-eater, and will strip the branches of a tree from top to bottom; in one winter a single Urson will destroy a hundred trees. It is a tolerably quiet animal, and is rather easily tamed, but if alarmed it is ad-



BRAZILIAN TREE PORCUPINE

visable to keep at a respectful distance, for, in particular, the creature has a habit of striking sharply with its tail, which is thickly set with short, sharp spines. An exceedingly ferocious mastiff once entered a garden and attacked a tame Porcupine. The rodent seemed to swell into double its ordinary size, and dealt the dog a sideways blow with its tail, with the result that his nose, mouth, and tongue were full of quills. The dog could not close his jaws, and hurried open-mouthed off the premises. Even when the barbs were extracted, the dog's head was swollen for weeks afterwards, and it was months before he finally recovered. The Red Indians use the quills in the decoration of their hunting-pouches, moccasins, etc., and they eat the flesh, which somewhat resembles flabby pork.

The Brazilian Tree Porcupine (*Syntheres prehensilis*) is not only

remarkable for its array of spines, but also for its long, prehensile tail, and well-armed, hooked claws. These last are of great service in drawing the animal from branch to branch, the tail only being used as an aid in descending a tree. The length of its body is about two feet, and the tail is a foot and a half ; its nose is blunt, and the face is furnished with long whisker hairs of a deep black. The spines of most Porcupines are parti-coloured, black in the centre, and white at each extremity. In the summer, when the Coendo, as it is called, is extremely fat, its flesh is in great request, being tender and delicate in flavour.

FAMILY : DASYPROCTIDÆ

THE AGOUTI (*Dasyprocta aguti*)

The Agoutis, of which there are several species, are natives of South America. The common Agouti is about the size of a rabbit, clothed with short, coarse, glossy hair, chiefly olive-brown in colour, but on the hinder parts it is four inches long and partakes more of an orange tint. In movement it is quick and active, and even while



AGOUTI

sitting upright and engaged in feeding by the assistance of its fore-paws, its bright eyes continually turn from side to side in order to guard against a surprise. It is a strictly nocturnal animal, spending the whole of the day in the cleft of a rock, the hollow of a decaying tree, or in burrowed cavities at its roots. It is rather a prolific animal, there usually being two broods in the year, each numbering from three to six young ones. Parties of a score or more Agoutis frequently wander miles from home, which is un-

usual with the majority of burrowing animals. Plantations are often raided in search of food, and this propensity has led to the extermination of the Agouti in many of the cultivated regions.

FAMILY: CAVIIDÆ

THE GUINEA PIG (*Cavia cobaya*)

Guinea Pig is a most inappropriate name for a typical rodent, and more especially as it is a native of South America, and not Africa. In disposition it is dull and unimpressible; it accommodates itself to a change of locality without betraying any emotion, and it does not seem susceptible to fear. It is a pretty, tailless creature that is in much favour as a pet for children, for it is a particularly cleanly animal, and never bites those who handle it. In colour it is very variable, but is generally white, red and black in patches that differ in size and shape in each individual. Its flesh is eatable, though not held in high estimation; its fur is useless to the furrier, since the hair is very slightly attached to the skin. The food of the Guinea Pig consists exclusively of vegetable substances, and, like many of its more or less near relations, carries its food to its mouth with its fore-paws. An idea of the extreme fecundity of the animal may be gathered from the fact that it commences to breed when it is ten months old; each brood consists of from six to ten young ones, which possess their second set of teeth at birth, so that when only forty-eight hours old they are able to nibble corn. When six weeks old their mother deserts them, and leaves them to shift for themselves, and after the lapse of only a few weeks she is fully occupied with the cares of another litter.

THE CAPYBARA (*Hydrochærus capybara*)

The Capybara, a native of tropical America, the largest of the Rodents, rather exceeds three feet in length, and attains a weight of nearly a hundred pounds. Its size, coarse hair, resembling the bristles of the pig, hoof-like toes, and its clumsy bearing, would lead one to suppose that it was related to the swine family, and, indeed, it is often called the Water Hog. Its coat is a dingy, blackish grey, with a tinge of yellow. The muzzle of the big cavy is heavy and blunt, the tail is wanting, and the toes are partially connected together by a development of the skin. It is a water-loving animal, and instinctively seeks a stream when danger threatens. It not only swims well, but is a capable diver and able to remain under water for several minutes; and when it reappears to take breath it only exposes the top of its head above the water. Its food is exclusively vegetable. Its incisor teeth are particularly large, and the molars are ridged, so as to pulp the

herbage upon which it feeds, thus enabling the food to pass through its remarkably narrow throat.

The Capybara, or Carpincho as it is also called, is a gregarious creature found in small herds on the banks of the streams which it



CAPYBARA

frequents. Its flesh, notwithstanding its musky odour, is accounted good, and can be preserved like ham or bacon. The jaguar is the Capybara's inveterate enemy, for being a rather listless, stupid animal, the big carnivore finds little difficulty in striking down a succulent and satisfying meal.

FAMILY : CHINCHILLIDÆ

THE CHINCHILLA (*Chinchilla lanigera*)

The Chinchilla, an inhabitant of South America, is clothed with exquisitely soft and silky fur, a delicate, clear grey upon the back, softening into greyish white on the underparts. The animal is small, and even including the tufted tail, measures only fifteen inches in length ; and as many skins are employed in the manufacture of one article of ordinary dress, the destruction of the Chinchilla is very considerable to cope with the demand for this popular fur. It appears, however, to breed all the year round, and is in no immediate fear of becoming extinct.

It lives in large communities in the higher mountainous districts,

where its thick, silky fur protects it from the cold. It is a confirmed burrower, and the trappers have to employ some member of the weasel family to drive the Chinchilla out into the open. Even then its capture is by no means a certainty, for it is remarkably agile, and views a precipitous wall of rock as but a trifling obstacle. The Chinchilla is exquisitely clean in its habits. Whenever an animal is noted for the beautiful delicacy of its fur, it is usually most assiduous in preserving it from contact with anything that will stain its purity or clog its fibres.



CHINCHILLA

THE VISCACHA (*Lagostomus trichodactylus*)

Though it is one of several allied species of the Chinchilla, the Viscacha is quite marmot in appearance. Its coat is more varied than that of the foregoing animal, and its texture is less silky. It is a burrower, but lives in smaller companies upon the pampas rather than in the hills. Its principal food consists of roots, and in cultivated regions it causes much damage to plantations and field crops. When engaged in a raid a sentinel is posted, and if the alarm is given, the foragers set off for their burrows with a



VISCACHA

rapid, but awkward gait. Its flesh is utilised for food by the natives of Southern Argentina, and the skins have a marketable value, but are much inferior to those of the chinchilla.

FAMILY: LEPORIDÆ

THE HARE (*Lepus europæus*)

All the rodents that have been described belong to the sub-order *Simplicidentata*, whose distinguishing mark is the possession of only two incisors above and below ; but the remaining rodents have four incisors in the upper jaw, for which reason they are known as the *Duplicidentata*, or double-toothed rodents.

There are about thirty species of Hare, nearly all of them confined to the northern hemisphere. The common Hare is greyish brown on the upper portions of the body, mixed with a dash of yellow ; the abdomen is white, and the neck and breast yellowish white. The tail is black on the upper surface, and white underneath ; the



HARE

ears are tipped with black, and are nearly an inch longer than the head. The animal measures about two feet in length, and a well-grown specimen will scale twelve or thirteen pounds. Its hearing is remarkably acute, and its eyes are placed so as to allow it to see backwards while running at full speed forwards.

The Hare is accounted a very timid animal, as signified in the specific name of one species. It is, however, only natural that it should run away when hunted by horsemen and a pack of dogs ; under such circumstances a lion or an elephant would think twice about showing fight. Really, considering its size and equipment, it is by no means a cowardly animal ; it will often boldly attack a man in defence of its young, and it wages savage fights with those of its own kind. When chased, the Hare displays almost as much cunning as the fox, doubling in its tracks, and leaping aside

to throw the dogs off the scent, and selecting the soil that will suit the formation of its feet, while proving disadvantageous to its pursuers; it will also run along the top of a freshly cut hedge, will seek the company of a flock of sheep, and will readily take to water if it offer a way of escape.

The Hare is not a burrower, but lies out in the open, pressed so flatly to the ground as scarcely to be distinguished from the soil and dried herbage where it takes up its temporary abode. Although its 'form' is scarcely deserving of the dignity of being called a home, the animal will return to the favoured spot after a long chase by hounds, only changing the locality of the 'form' in order to gain protection from the bitter frosts and snows of winter, or the blazing rays of the noontide sun.

Included with the pheasant, partridge, and grouse under the title of 'game,' the Hare may only be killed in our country during certain seasons of the year, and only sold by licensed dealers in game. In early times the game laws were brutally severe, and for a commoner to trespass on the preserves of the great landowners entailed terrible punishments, such as the loss of hands or eyes. In most countries the flesh of the Hare is very highly esteemed; almost all predaceous animals and birds persecute it, and notwithstanding it is a very prolific creature, it would long ago have been exterminated in our country but for the game laws.

The Mountain Hare (*L. timidus*) abounds in Northern Europe, Asia, and America. From Russia we import vast numbers for food, but they do not command such high prices as our native-bred animals. The Arctic Hare (*L. glacialis*) is wholly white, except the black-tipped tail. All Hares, it may be remarked, take on a lighter tint in severe weather. This northern species makes its 'form' not in the grass, but in the snow, the feathery flakes gradually forming a domed chamber, in the top of which the animal's breath preserves a ventilating air-hole. This aperture, if it ensure safety in one direction, often brings disaster in another. The Hare hunter trains his dogs to search for air-holes, and to stand sentinel over them until he arrives to effect the capture of the creature ensconced under the snow.

THE RABBIT (*Lepus cuniculus*)

It is easy to distinguish the Rabbit from the hare, owing to its smaller size, its different colour, its smaller brown ears, and its shorter limbs. To describe the manifold antics of the inhabitants of a Rabbit warren would occupy far too much space. They are such odd, quaint, ludicrous beings, full of absurd airs of assumed dignity and comical little coquetries, that a concealed observer cannot refrain from bursting into irrepressible laughter. At one time they are gravely pattering about the doors of their subterranean homes, occasionally sitting upright, and gazing in every

direction, as if fearful of a surprise. Next moment, some one gets angry, stamps his feet fiercely on the ground preparatory to engaging in a regular fight. Suddenly a number rush off at full speed, as if they meant to run a mile at least, but unexpectedly stop short to nibble at some tempting herbage. Then a sudden panic attacks the whole party, there is a rush and scurry, a bobbing of white tails, and every Rabbit vanishes into the burrows like magic.

The Rabbit is one of the most prolific of the rodents, commencing to breed when it is six months old, and bringing into the world several families a year. The introduction of the animal into Australasia was attended with very unforeseen results. In the course of less than half a century a Rabbit plague was threatening



DUTCH RABBIT

the colonial agricultural industry with absolute ruin. It was only by the expenditure of immense sums of money, and the protection of crops by rabbit-proof wire-fencing, that disaster was averted, and then the colonists set to work to convert the pest into money. Every year millions of Rabbits, tinned and frozen, are exported to the United Kingdom for use as food, together with vast quantities of skins for manufacturing purposes. Rabbit and hare skins are of considerable commercial value, for not only can they be utilised in the production of warm, useful, and cheap clothing, but the fur is also stripped from the skins to be mixed with various glutinous substances, and then pressed into felt.

As it is more tameable than the hare, the Rabbit has long been ranked among the chief of our domestic pets, and has developed into many permanent varieties, that would be taken for different species by one who saw them for the first time. The little brown

short-furred wild Rabbit of the warren bears hardly less resemblance to the long-haired, silken-furred Angola variety, than the Angola to the Dutch Rabbit, or to the pure lop-eared variety, with its enormously lengthened drooping ears, and its heavy dewlap. Some tame Rabbits, especially the variety known as the Flemish Giant, will attain a weight of eighteen pounds.

ORDER : UNGULATA

THE HOOFED ANIMALS

The Ungulata is an order of the first importance, for, with the exception of the hare and rabbit, it includes all our domesticated mammals which are used for food. Many of the Ungulates show marked differences in structure, and most of them are of considerable size. All of them are vegetable feeders, though some of the swine family are practically omnivorous. The term Ungulata is derived from the Latin word *ungula*, which denotes a nail, hoof, or claw. All the members of the order are hoofed animals, which fall rather easily into four sub-orders.

SUB-ORDER : HYRACOIDEA

FAMILY : HYRACIDÆ

THE HYRAX (*Hyrax syriacus*)

The Hyrax is one of the most curious little animals in existence, because of its importance in filling up a link in the chain of creation, and the puzzle it long presented to naturalists. It is about the size



HYRAX

of an ordinary rabbit, covered with thick, soft fur, possessing incisor teeth, and living in burrows. Being a rabbit in appearance, habits, and manners, it was long classed with the rodents, until it was discovered that it is really one of the *Pachydermata*, or thick-skinned animals, and that it is closely related to the elephant. Its toes are united by skin to the very nails, just as in the elephant and rhinoceros, and its teeth are bevelled off like those of the hippopotamus.

The Syrian Hyrax is the 'Coney' of the Old Testament. It ranges from Syria, through Arabia to Abyssinia, inhabiting the clefts and caverns of rocks, or burrowing holes for itself. The Cape Hyrax (*H. capensis*) is called by the colonists 'Klip Das' or Rock Rabbit. It may often be seen sunning itself, or feeding on the aromatic herbage on the mountain-sides. In spite of its apparent carelessness, a sentinel is always on guard ready to warn its companions by a peculiar shrill cry upon the approach of danger. There are other species in East and West Africa very similar in appearance and habits, except that they are also very agile tree climbers.

SUB-ORDER PROBOSCIDEA

FAMILY : ELEPHANTIDÆ

THE ELEPHANTS

There are only two species of Elephant, the Indian and the African, very similar in external form, but easily distinguished from each other by the dimensions of the head, and the size of the ear. In the Indian animal the head is elongated, the forehead concave, and the ears of ordinary size, while in the African Elephant the head is much shorter, the forehead convex, and the ears of enormous spread, nearly meeting on the back of the head and hanging with their tips below the neck. The molar teeth also indicate the species of their owner. Each of these teeth seems to be composed of a number of flat, broad teeth, which are fastened closely together to form a single large mass. Only a portion of each tooth is externally visible, the remainder appearing as the exposed portion is worn away. When the whole tooth has become worn it falls from the jaw, and another takes its place. In this manner the Elephant sheds its molar teeth six or seven times in the course of its life, but it must be remembered that the animal lives to a hundred years or more in captivity, and in a wild state may exceed that age. The plates of the molar teeth of the Indian Elephant, viewed from above, present a series of narrow ovals, while those of the African are diamond-shaped. The upper incisor teeth are usually developed into large tusks ; in the Indian Elephant only the males are furnished with them, and not a few of that sex are without them ; but in the African species both sexes are tusked, those of the male being the larger and heavier.



PLATE VIII

African Rhinoceros
Indian Elephant



The strangest portion of the Elephant's form is the trunk, or proboscis. This appendage is a wonderful development of the upper lips and nose, perforated throughout its entire length by the nostrils, with a finger-like process at the end, which enables the animal to pluck a single blade of grass or pick up a minute object from the ground. The value of the proboscis to the Elephant is almost incredible. Without its aid the huge creature would soon starve, for the short, thick neck would not permit it to graze ; the projecting tusks would hinder it from reaching vegetables growing at the level of its mouth, and as it would be unable to draw water into its mouth without the use of the hose-like trunk, thirst alone would speedily end its existence.

The head of the Elephant must of necessity be of large dimensions in order to support the enormous weight of the teeth, tusks, and proboscis ; but it is not nearly so heavy as its magnitude would suggest. The skull consists of a collection of cellular structures built around the small cavity containing the brain, which is, therefore, defended from severe concussions when the animal employs its head as a battering-ram. This formation of the skull renders it easy to understand the difficulty of killing an Elephant by a shot at its head, for unless the bullet enters an aperture leading to the brain, such as the eye, ear, or nostril, it does little damage. As the skulls of the Indian and African species differ in shape, a bullet which will destroy one animal may fail in the case of the other.

In order to support the enormous weight which rests upon them, the legs are very stout, and are set perpendicularly, without that bend in the hinder leg which is found in most animals. This pillar-like structure is of infinite use when the animal climbs or descends steep acclivities, a feat which it can perform with marvellous ease. Considering its bulk the Elephant is remarkably active ; it can lie down and regain its feet as easily as a dog ; it can stand upon its hind-feet alone, or erect itself upon its fore-feet ; and it can even stand upon its head. It cannot trot or gallop, but nevertheless can move along at eight miles an hour if needed. An ordinary wall, seven feet high, would not of necessity stop an Elephant's progress, since its huge weight and strength could be used to push the structure down ; but a ditch seven feet wide would prove a complete bar, as the animal's maximum stride is only six and a half feet, and it cannot jump an inch.

Having thus briefly sketched some of the characteristics common to both species, we may proceed to consider the animals separately.

THE INDIAN ELEPHANT (*Elephas indicus*)

The Indian Elephant, as a rule, does not exceed nine feet in height at the shoulder, with a length of twenty-six feet from the tip of the trunk to the extremity of the short tail ; although in

Calcutta Museum is the skeleton of an animal that was twelve feet in height. The colour of the rough, leathery hide is rather a light brown when the animal is at liberty, but tame animals are rubbed with oil at intervals, which darkens the skin considerably. The skins of all the pachyderms are thick, and on an Elephant's back four inches is no uncommon thickness; and the hides of captive animals suffer from dryness which causes cracks that are not only painful, but often lead to other ills.

In the south of Asia the Elephant has, for long ages, proved itself a capable servant and companion of man. Large numbers are captured annually, and quickly become subjected to their owners.



INDIAN ELEPHANT

In all work that requires great strength and judgment, the Elephant is superior to any other beast. In piling logs, for example, it will place them upon each other with a regularity almost equal to that performed by human workmen. The working Elephant, however, is always a delicate animal, and requires watchfulness and care. As a beast of burden it is far from satisfactory, for although it can carry immense weights, the load often causes abrasions that afterwards ulcerate. Drought, or too much moisture, renders the feet liable to sores; and its eyes are very subject to inflammation. The keep of an Elephant is double or treble that of a horse, and it can only work on an average four days a week. But in rude and unopened regions, where rivers have to be forded, and forests are traversed by jungle paths, the huge beast is of great service. The military authorities in India have found it extremely useful in

carrying field-guns and warlike stores into mountainous regions that would be totally inaccessible to a horse.

The herds in which this Elephant congregates are not of very great size, rarely exceeding thirty individuals, probably members of the same family. It is rather a remarkable fact that a whole herd has never been known to charge a foe simultaneously. In its general habits the animal is restless and irritable, never remaining quite still, but always in motion in some way or other. At one time it will sway backwards and forwards, at another it will stoop and rise continually; it will be getting sand or water and sprinkling it over its body, or it will pluck a leafy branch and wave it gracefully above its head. It is very fond of bathing, and draws a mixture of mud and water into its trunk and discharges it over its back. It is an admirable swimmer, and will cross large rivers with ease. Sometimes it prefers walking on the bed of the stream, merely protruding the tip of its proboscis above the surface for the purpose of breathing.

The Indian Elephant is employed more for the purposes of state, or for sport, than for hard labour, and is especially trained for tiger-hunting, to which reference has been made in earlier pages. So-called White Elephants, which at best are a dirty white-brown, are considered royal animals in Further India. The King of Ava is styled the 'Lord of the White Elephants,' and in state processions these animals are decorated with strings of priceless gems, and their very eating-troughs are of silver.

THE AFRICAN ELEPHANT (*Elephas africanus*)

The African Elephant in comparatively recent times ranged from Senegal and Abyssinia to the borders of Cape Colony; but it has now been driven out of the settled districts by remorseless hunting for ivory. It is generally larger than the Indian species, and averages a little over ten feet in height. Jumbo, one of the most famous animals ever located at the Zoo, was eleven and a half feet high, and weighed very nearly seven tons. He was born in captivity, and wild animals not infrequently exceed those dimensions; Oswell, a noted hunter, recorded 12 feet 2 inches as the height of one huge animal that fell to his rifle.

The Carthaginians utilised the services of the Elephant in warfare, and the Romans used it for sporting purposes in their arenas; but nowadays only its tusks, teeth, and skin have any commercial value, although a mountain of flesh is not disdained by the African natives. Many males carry tusks, which average from 35 to 70 lbs. the pair; but in East Equatorial Africa bulls frequently have tusks measuring nine feet along the curve, and weighing as much as 15 lbs. The largest Elephants do not necessarily possess the best tusks. Mr. Grogan shot a bull 11 feet 6 inches high, whose tusks weighed only 85 lbs. each. In the Natural History Museum,

South Kensington, is an enormous tusk, nine feet in length; but a pair secured in East Africa measured over ten feet each, and weighed 224 lbs. and 235 lbs. respectively; they were sold to a museum in the United States for £1000.

It is sometimes stated that the Elephant is likely to become extinct in Africa. Mr. F. C. Selous, the famous big-game hunter, ridicules the idea. He says that "Wherever the British flag flies



AFRICAN ELEPHANT

in Africa, north and south of the Zambesi, the Elephant is protected. In Uganda a big-game licence for a year costs £50. Its holder may shoot only two Elephants in that period, and the number of other animals he may shoot are scheduled. Taking South Africa as a whole, there has been no decrease in Elephants during the last twenty-five years. They are no more likely to become extinct than is the giraffe." This is borne out by Messrs. Grogan and Sharpe, who, recently, in the Ruwenzori region, saw as many as a thousand to fifteen hundred Elephants in one day's march.

SUB-ORDER : PERISSODACTYLA

The three families in this sub-order contain the odd-toed animals. Though the Tapirs have four digits on the front feet there are only three on the hinder ones ; the Rhinoceroses possess three toes on each foot ; and the Horses have feet consisting only of a single developed digit.

FAMILY : TAPIRIDÆ

THE AMERICAN TAPIR (*Tapirus americanus*)

The Tapirs are hog-like animals in general appearance, with the snout lengthened into a kind of proboscis. The common Tapir is widely distributed throughout the warmer regions of South



MALAYAN TAPIR

America. It measures from seven to eight feet in total length, stands about four feet high at the shoulder, and is of a uniform brown colour. The young ones are beautifully variegated with yellowish-fawn spots and stripes upon a background of rich brownish black. In disposition the animal is shy and inoffensive, but when annoyed it will rush at its antagonist and defend itself vigorously with its powerful teeth. Its food consists of leaves, fruits, etc. It is a semi-aquatic animal, and is found in the vicinity of large rivers, spending much of its time in diving, and is reported to walk under water at the bottom of a lake or river. Though its appearance is clumsy, it is strong, and upon occasion can show marked activity. When a jaguar springs upon it, the affrighted Tapir dashes for water, tearing through the undergrowth at a speed and with a force that not infrequently brushes off its fiercely clinging enemy, whose first onslaught makes little impression upon the thick hide.

The Malayan Tapir (*T. indicus*), standing rather more than four feet high, is a larger animal than its American cousin, but its habits are very similar. Its distinguishing mark is the greyish-white colour of the loins and hind-quarters, which gives the animal an odd appearance, as if a white horsecloth had been spread over it.

FAMILY : RHINOCEROTIDÆ

THE RHINOCEROSES

The word 'Rhinoceros' signifies 'horned-nose,' and each of the various species possesses at least one horn, while the snouts of some are furnished with two. The horns are not connected with the skull, being attached merely by the skin, and they may thus be separated from the head by means of a sharp knife; they are hard, capable of a high polish, and are a fine material for drinking-cups, etc. The upper lip is considerably prolonged, and in most of the species is prehensile, and by means of it the animal can pick up the smallest objects from the ground. There are no canine teeth, but in the lower jaw not infrequently is a pair of tusks, large, pointed, and almost horizontal. The skin is rough and warty, and of remarkable thickness and strength, and the natives manufacture it into very effective shields. The figure of the Rhinoceros suggests the last word in clumsiness, but it is far swifter than some slimly built animals.

THE INDIAN RHINOCEROS (*Rhinoceros unicornis*)

The Indian Rhinoceros rarely exceeds five feet in height, and is remarkable for the heavy folds into which the gnarled, blackish



RHINOCEROS

grey hide is gathered, forming large flaps that can easily be lifted up by the hand. It suffers greatly from parasitic insects that creep behind the folds, and it is to get rid of these pests that the animal is so fond of wallowing in mud and water. The skin of the underparts is comparatively soft, and rather easily pierced by a spear. Its single horn, though somewhat short, is wide and heavy, and by means of the weapon the animal can repel the attack of a bull elephant. The Rhinoceros frequents swampy jungles, where the grass grows to a height of twenty feet or more. Its organs of scent and hearing are very acute, and it is necessary for hunters to exhibit the greatest care, lest in a fit of fear or fury the ponderous creature charges out of cover before a shot can be taken at it. Mounted elephants are often used to beat the Rhinoceros out of its retreat, and sometimes one of the huge creatures and its rider are brought to the ground in a collision with a stampeding animal.

The Sumatran Rhinoceros (*R. sumatrensis*), though a smaller animal, is sometimes a ton in weight. It possesses two horns, which the Chinese grind into powder for use as a sovereign remedy in the treatment of various diseases.

THE BLACK RHINOCEROS (*Rhinoceros bicornis*)

Of several African species the Black Rhinoceros, or Borele, though not the largest, is one of the fiercest and most dangerous. Its habitat is East and South Africa to about the borders of Cape Colony. It is double horned, the foremost one, bent slightly backwards, being from twenty to thirty inches long, while the back horn is conical, and only half the length. The skin is not folded, but, nevertheless, is hard and tough. The sight of the Rhinoceros is never good, and in this instance is further impeded by the larger horns; but there is nothing lacking in its hearing and scent, and it is second to none in wariness.

When wounded, the Black Rhinoceros is a truly terrible opponent. Although so clumsy in shape and aspect, it can dart with lightning speed, and test the powers of a good horse to escape from its charge. On one occasion an angry beast dashed upon a waggon, and struck his horn into the bottom plank with such force as to send the vehicle forward several paces, although it was sticking in deep sand. He next directed his attack upon the fire, knocking the burning wood in every direction. He continued his wild career, for a spear, flung by a native, only bent its iron point against the strong hide.

The Keitloa (*R. keitloa*) is a bigger and even more ill-tempered animal, with two horns of nearly the same length. Andersson had a particularly strenuous encounter with a wounded animal. Charging suddenly upon him, she knocked him down, fortunately missing her stroke with her horns, but passing fairly over him, leaving him to struggle out from between her hind legs. She turned and made a second charge, cutting his leg from the knee to the hip with her

horn, and again knocking him over with a blow from her fore-feet. She might easily have killed him, but, instead, she plunged into a thicket, and permitted her victim to escape. Later in the day the same beast attacked Andersson's half-caste boy attendant, and would probably have killed him had not the hunter come to the rescue with his gun. After receiving several bullets the Rhinoceros fell to the ground, and the hunter walked up to her to put the muzzle of the rifle to her ear. Before he could pull the trigger she again leaped to her feet; he hastily fired and rushed away, pursued by the infuriated animal, which, however, fell dead just as he threw himself into a bush for safety.

Burchell's Rhinoceros (*R. simus*), or Mochuco, is the largest of the family, standing six or seven feet high at the shoulder, and measuring sixteen or seventeen feet in length. It is also called the White Rhinoceros, being a slightly paler brown than the foregoing species. Its front horn grows to a great length; one in the South Kensington Museum is fifty-six inches long, and one hunter possesses a trophy that exceeds it by six inches. Though it is a less offensive animal than the Borele or Keitloa, the White Rhinoceros is not to be despised as an opponent. Upon one occasion a wounded beast did not charge, but walked towards its mounted opponent, whose horse at that moment became unmanageable. Without preliminary warning, the Rhinoceros bent its head, and with a thrust upwards struck its front horn into the ribs of the horse, penetrating the saddle, and injuring the rider's leg on the other side. The horse turned a complete somersault in the air, and came down upon its back. Fortunately the angry brute was satisfied with its exploit, and did not stay to vent its anger on the disabled hunter, but left the scene of action at a canter.

The natives of Africa enjoy Rhinoceros meat, but Europeans do not set much value upon it. One hunter describes it as being dark-coloured, coarse, and peculiarly flavoured—a little more beef than fowl, and a little more fish than beef. The thick, hard skin is employed by the colonists in the manufacture of whips, or sjamboks.

FAMILY: EQUIDÆ

THE HORSE (*Equus caballus*)

The domesticated Horse is too familiar to call for elaborate description. The Arabian Horse and the Race Horse, models of elegance and beauty, and noted for their speed, are in marked contrast to the heavy Dray Horse of the Flanders breed, or the sturdy little Shetland pony, that is sometimes less than three feet in height. A Horse can carry with comfort not more than 120 lbs. on its back, but its strength in haulage is remarkable. One Dray Horse was put to a remarkable test. Upon rails it dragged a weight of 55 tons a distance of more than twenty miles in six hours. In



PLATE IX

American Tapir
Mountain Zebra

all parts of the world where the climate will allow it to exist, the Horse renders man inestimable service.

The Horse and the ass have been domesticated so long, that their exact origin is more or less a matter of speculation. There are herds of Wild Horses in Central Asia and South America, but it is practically certain that they are but the descendants of domesticated animals that long ago reverted to a wild state. In any case, however, their habits are doubtless the same as before the animal became the invaluable servant of man. In Mongolia and Tartary the Tarpan is found in herds acting under the command of a single



MONGOLIAN WILD HORSE

leader, and observing a wonderful spirit of discipline. The colour of this Horse is a reddish brown, with a black stripe along the back. The Tartars capture the best and strongest animals to recruit their studs. Very often trained falcons are used for Horse hunting. A bird will settle upon a selected animal's head, and flutter its wings about its face, so as to blind and detain it until the hunter comes up to secure his prize. A short apprenticeship, coupled to tame animals, causes the creature to lose its wildness, and implicitly obey the commands of its master.

The Mustang of South America is probably descended from Spanish Horses that escaped into the wilds in the early days of the occupation of the New World by the Spaniards. It is said that the Horse was indigenous to South America, but that it had been

exterminated by the pumas before the advent of Europeans. Congregated into vast herds, the Mustangs unite to drive off the jaguar and puma, but which, nevertheless, contrive to lay heavy toll upon the foals. To capture a Wild Horse is no easy matter. The gaucho of the pampas chases one until he is near enough to throw his lasso, or long slip-noose, perhaps a distance of thirty feet, to alight round the Mustang's neck; or sometimes its legs are entangled, and the hunter, riding off at an angle, jerks his captive off its feet. Before the wild animal has recovered from the shock, the gaucho seats himself upon its head, while his companions gird a saddle tightly on its back, and force a bit into its mouth. The teeth of the Horse have played no small part in its subjugation by man. Between the canines and the molars is a gap, which is called the 'bar,' and it is this space which holds the bit by which the animal is controlled. The gaucho then stands astride the prostrate animal which leaps up the moment it is released, and attempts to dislodge its rider. The gaucho is a perfect horseman, and, notwithstanding his steed's frantic efforts to get rid of the unusual encumbrance, sits in the saddle with the utmost complacency. Shortly, the Mustang is quite worn out by its exertions, and bit and spur complete its submission.

Australia, too, has its Wild Horses, but these are positively the descendants of animals imported by the colonists. They are small, and rather ugly-headed Horses, that multiplied so rapidly in some regions as to be a continual menace to the settlers' crops; and they were hunted down until their numbers were reduced to manageable proportions. It is far from likely that ever again several thousand 'Brumbies' will be shot on one station, as was the case in New South Wales in 1875.

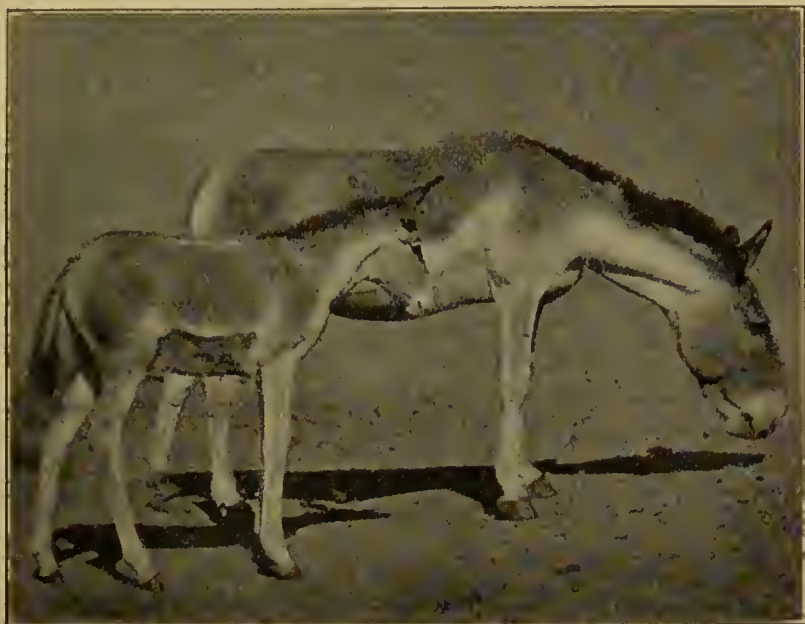
THE WILD ASS

The Wild Ass is found in Central Asia, Persia, and Syria; and in Africa it ranges over vast tracts in the Sudan, Abyssinia, and Somaliland. All the various species are smaller than the horse, with a shorter, stiffer mane, longer ears, and a more thinly haired and rather tufted tail. They are all extremely fleet and sure of foot.

The Asiatic Wild Ass (*Equus hemionus*) is well known under the names Koulan, Onager, and Kiang, the last only in Tibet. It is the Wild Ass of the Scriptures, the Dziggetai so admirably described in the Book of Job. It is about four feet in height, and generally of a reddish-grey or chestnut colour, with a dark stripe on the back, and the underparts white. It lives in troops that frequent the hills in summer and the plains in the colder months. Upon rocky and hilly ground it is amazingly swift, and not even the greyhound can follow it with any hope of success. The tawny yellow of the young foals well harmonises with the sandy steppes upon which they are born, and even wolves and vultures have a difficulty in perceiving

them until they are old enough to join the troop with their mothers. The foals are captured by riding them down with relays of horsemen and greyhounds, but the adult animals are chiefly hunted for the sake of their flesh, which is considered a great dainty.

The African Wild Ass (*E. asinus*) differs from the Asiatic animal in colour, and has much longer ears, and a black and shorter mane. The hair is bluish grey in colour with a creamy tinge rather than rufous; in addition to the stripe along



WILD ASS AND FOAL

the spine, there is another across the shoulders, and the limbs are marked with dark bars.

There is little doubt that the Domestic Ass is descended from this animal, and that it was in the Nile Valley where it was first used as the servant of man. In our own country the Ass is considered dull and obstinate, and is only used for laborious tasks. In Eastern lands, where it is bigger, and is employed by the highest, it is an elegant and spirited animal, with a smooth and well-tended coat. White Asses are always reserved in the East for bearing persons of distinction.

In the South of Europe, and various mountainous regions in South America, the Ass is large, and proves a useful pack animal, its sure-footedness serving well on poorly constructed bridle paths. Mules are cross-bred animals, the offspring of a male ass and a female horse. They are midway between the horse and the ass in size, and are endowed with special powers of endurance for carrying burdens in wild and rocky regions.

THE ZEBRA (*Equus zebra*)

The Zebra is a conspicuously beautiful animal. Upon a background of creamy white are velvety black stripes, covering the head, neck, body, and limbs, down to the hoofs; the tail is sparingly covered with coarse black hair. The true, or Mountain, Zebra

formerly inhabited the mountainous districts of Cape Colony, but there now remain only a few that are strictly preserved in some of the more remote portions of the Colony.

Burchell's Zebra (*E. burchelli*) is found further north. It is a taller animal, more yellowish-brown in colour, with the dark stripes not nearly so regular, and generally absent on the inside of the legs.



BURCHELL'S ZEBRA

Grevy's Zebra (*E. grevyi*) ranges the Victoria Nyanza regions. Narrower stripes are its distinguishing feature.

With sight, hearing, and smell developed most acutely, and fleet as the wind, the Zebra is most difficult to approach. When attacked by even the biggest carnivores, a troop will combine and present their heels to the foe, often causing even the lion to postpone its proposed meal. In disposition all the Zebras are obstinate, and at one time were considered quite untameable. The Dutch colonists attempted to domesticate it, but met with little success. Even when an animal had worked with fair docility in harness, it would return to its stable with such speed and fierceness that it endangered the lives of those who had care of it. Frequently Zebras will mingle with the horses and asses grazing on outlying farms, but they will not interbreed with them.

THE QUAGGA (*Equus quagga*)

Slightly smaller than the zebra, the Quagga once roamed over South Africa in immense numbers, frequently in company with gnus and ostriches. Owing to constant persecution by the natives, who pursued it both for its skin and flesh, it is doubtful if any of the species now exist in its former haunts. The colour of its body is chiefly brown, and it but partially possesses the characteristic zebra stripes, being decorated only upon the fore and hind quarters. It was much more amenable to discipline than the zebra, and nearly a hundred years ago a couple of male Quaggas was driven in harness in Hyde Park.

SUB-ORDER : ARTIODACTYLA

In this sub-order are included all the even-toed animals, which possess two or four digits on all the feet. The majority of the ungulates have feet of this type. All of them are purely vegetable feeders except the omnivorous swine, and the great majority are ruminating animals. They are divided into four very distinctive groups :—

I. PECORA—the true ruminating animals, viz. oxen, sheep, goats, antelopes, giraffes, and deer. They first pass their food into a receptacle of the stomach, called the paunch, from which it is returned to the mouth in small quantities, to be chewed while the animal is at rest.

II. TRAGULINA—small, deer-like animals, whose upper jaws are furnished with long canine teeth, forming small projecting tusks.

III. TYLOPADA—ruminating animals, but whose feet are provided with hardened skin instead of hoofs.

IV. SUINA—non-ruminating animals, that do not chew the cud yet divide the hoof.

THE HOLLOW-HORNED RUMINANTS

FAMILY : BOVIDÆ

The Common Ox (*Bos taurus*) is spread widely over nearly all the earth, except the coldest regions, and there is scarcely any country without its own peculiar breed. In our own country there are nearly as many breeds as counties, generally distinguished from each other by the length or shape of their horns ; some breeds fatten easily, and are fed for the butcher ; others are noted for their milking qualities, and are valuable for the dairy. The magnificent herds of cattle in our colonies, notably Canada and Australia, and in the United States and Argentina, are of British stock, and they are constantly improved by the importation of prize animals. The Ox formerly ran wild in Great Britain, and at Chillingham Park there is still a breed of wild cattle, supposed to be descendants of the

original race. In colour they are always white, with dark red ears. It is impossible to mention all the oxen of the world, domesticated and wild, but even a selected few will show the indebtedness of man to a family of animals second to none in usefulness, either alive or dead.

THE ZEBU (*Bos indicus*)

The Zebu, Indian Ox, or Brahmin Bull, is a native of India and adjacent countries, but it has also been transported to East Africa and Madagascar. There are several breeds ; some are larger than British oxen, and some do not greatly exceed the dog in size, but all of them bear a conspicuous hump upon the shoulders. It is a



ZEBU

good draught animal, and is harnessed either to the cart or plough, and in passing it may be remarked that in some parts of England oxen are still used for field work. The Zebu is also utilised for riding, and as a pack animal it can carry a heavy load, but at no great pace. Many of the bulls are consecrated to Siva, and they are indulged by the pious Hindoos in a most absurd manner. A sacred bull is allowed to help himself to the contents of the fruiterers' stalls, and if he should happen to lie down to doze in a narrow thoroughfare, all the traffic is suspended until the holy animal has finished his nap.

THE WILD OXEN

In many parts of the world, such as India, Australia, and South America are herds of wild cattle, whose forbears were domesticated animals that strayed into the forests and almost illimitable grass lands. They have become as wild as ever was the Aurochs, the ancient Wild Ox of Europe, from which Western domesticated cattle are doubtless descended. In many regions are genuine Wild Oxen, to which brief reference must be made.

The Gaur (*Bos gaurus*) chiefly inhabits the hilly, forested regions between the north-eastern Himalaya, and the Malay Peninsula. It is the largest of the Ox tribe, a fine full-grown bull attaining a height of seven feet at the shoulders, with a bulk in proportion. In colour it is generally brown, with a tendency towards black, except for its very distinctive white stockings. The horns are greenish yellow, and are often quite three feet in length. Living in small herds in the deepest forests, it only issues in the early morning and evening to feed on the small patches of verdure in the glades. A herd lies down in a circle with their heads outwards, so as to preserve equal vigilance on every side. The animal is usually mild in temper, but solitary bulls are often extremely vicious. One has been known to force a traveller to take refuge in a tree, and was so determined to wreak vengeance upon him, that the irascible beast kept watch at the foot for twenty-four hours until the man's friends arrived and shot it. The north-east hill tribes have domesticated the Gaur on a very small scale.

The Gayal (*Bos frontalis*) ranges the regions east of the Brama-putra. It is a smaller animal than the last-named, with a less prominent shoulder-ridge, and a bigger dewlap. The natives are often able to capture a whole herd by taking advantage of its liking for salt. Balls of salt and a certain kind of earth are strewn about the district that the wild animals frequent. Presently domesticated Gayals are sent to mix with their wild brethren, and a little later the native shows himself, and familiarises his prospective captives with his appearance. At the end of five or six weeks he is able to drive the mixed herd home, having gained a welcome addition to his stock.

The Banting, or Javan Ox (*Bos sondaicus*), is a strong, fleet, and active animal that is found in Burma, the Malay Peninsula, and some of the larger East Indian islands. It frequents wooded valleys in small herds, under the watchful guardianship of vigilant sentries. The Malays find it an easy matter to capture and domesticate the animal, and mixed herds of Bantings and zebus are quite common.

THE YAK (*Bos grunniens*)

The Wild Yak, or Grunting Ox, is a native of the mountains of Tibet. It is a big animal with stoutly built legs, and has a shaggy coat of long and rather silky hair that is black or white, or a mixture of both. It ranges over desolate regions at an elevation of 20,000 feet, where there is only very wiry pasturage, and little even of that. In a domesticated state the Yak is exceedingly useful. In the Himalayan regions it is the only beast of burden that can exist in



YAK

the rigorous climate of the high solitudes between India and Tibet. Even in a temperature too low for the thermometer to register, the loaded Yak scrambles along the steep, perilous, frozen tracks. If it lose its footing and fall down a gully it will return to its companions, and again resume the monotonous march. Yaks that are used for ploughing in the rather milder regions are often deprived of their tails, which are in great request for various ornamental purposes. Dyed red, the appendage is formed into the curious tufts with which the Chinese decorate their caps; mounted in a silver handle, it is used as a fly-flapper in India under the name 'chowry'; and in many Eastern ceremonial processions tails are borne before certain officers of state, their number indicating their rank.

THE BISONS

The Bisons, though not as large as some of the foregoing animals, are heavily fronted, very stoutly built oxen with their withers higher than the hind quarters, which effect is intensified by the masses

of woolly hair which hang over the head and shoulders of the male animal. The European Bison (*Bos europæus*) formerly roamed the forest regions of the Continent, and in great hunts scores were killed in a day. Only a few hundreds of animals now remain, and they are strictly preserved in Lithuania and the Caucasus.

The American Bison (*Bos americanus*) less than half a century ago ranged over the northern prairies in countless thousands; but thanks chiefly to the transcontinental railways, only a few trifling herds remain, preserved by the Government, chiefly in the Yellowstone National Park. This rapid extinction of a whole species of big quadrupeds, standing nearly five feet high, and weighing



AMERICAN BISON

from 1500 lbs. to 2000 lbs., is one of the most melancholy incidents in the history of the animal world. The Bison was the main support of the Red Indian, who lived on its flesh, fresh or preserved; of the hide were made wigwams, shields, robes, shoes, etc. The savage hunted the animal remorselessly, but as long as it was done in a legitimate sporting manner little impression was made upon the herds, one of which would sometimes extend over a hundred miles of country. The Bison is very timid, and a herd was easily stampeded; and often the Indians would drive hundreds of panic-stricken creatures towards a precipice, over which they would dash to their death. The hunters would only take the hides and the most delicate parts of the meat, leaving the remainder to the wolves and birds. With the opening up of the prairies by the white

man the destruction of the Bison increased to an appalling extent ; in the two years 1872-74 it was calculated that over four and a half millions were slain for the sake of their hides alone. The work of annihilation proceeded apace, until the vast herds that once blackened the prairies have become little more than a memory.

THE BUFFALOES

The Buffaloes are usually bigger than domesticated oxen ; they are dark in colour and very thinly haired. The horns are peculiar in being flattened at their base. The European Buffalo (*Bubalus vulgaris*) is now domesticated, and in the South of Europe, Asia Minor, and Egypt, is employed in field work, and as a pack animal.



DWARF BUFFALO

The Indian Buffalo (*Bos bubalus*) stands nearly six feet high at the shoulders, and has horns about six feet in length ; it is also called the Arnee and the Water Buffalo, this latter because it frequents wet and marshy localities, and often chews its cud while lying in mud and water. The Arnee is gregarious, like all bovine animals, and a mud-covered, dripping beast, with its fiercely glaring eyes, presents a rather terrifying appearance. It is always savage to a marvellous degree, and does not hesitate to attack any animal that has raised its ire. A tolerably sized elephant is laid low by a vigorous charge in the ribs, and even the tiger prefers to give it a wide berth. The native Hindoo princes sometimes organise fights between the Arnee and the tiger, and the latter is almost invariably impaled upon the horns of the Buffalo ; but the victor is generally much lacerated and has to be destroyed.

The Cape Buffalo (*Bos caffer*) is quite as formidable as its Indian relative, and the heavier bases of its horns form a massive helmet on the forehead, giving it an additionally morose aspect that is quite in keeping with its real character. The Indian animal is said never to charge a human being, but the Cape Buffalo, though a smaller animal, possesses greater strength, and fears neither man nor beast. A full-grown bull has been known to beat off three lions, and a herd of cows will guard their calves all through the night, and leave the lions supperless. The flattened horns so protect the Buffalo's head that a shot at three yards' distance takes little or no effect. A wounded bull is a particularly dangerous opponent, for it will take shelter in a thicket and remain closely hidden, awaiting an opportunity to rush out and wreak vengeance on its foe. The flesh of the animal is not in very great request, even by the Kaffirs, whose palates are by no means over-sensitive; but the hide is excellent for the manufacture of leather implements where great strength without flexibility is required. The leathern traces for harnessing oxen to trek-wagons, and numerous strong straps are almost exclusively made of Buffalo hide.

In West Africa are various species of Buffalo, with shorter and less flattened horns than the animal just described. The Dwarf Buffalo (*B. nanus*) is an inhabitant of Senegal and neighbouring regions, and well illustrates the bony frontlet formed by the spreading bases of the horns.

THE MUSK OX (*Ovibos moschatus*)

The Musk Ox, somewhat resembling a big, hairy ram, inhabits the extreme north of America, and appears to form a link between the oxen and the sheep. It is about the size of our small Highland cattle, but its long coat of yellowish-brown hair, reaching to its feet, causes the animal to look bigger than it really is. Underneath the long hair is an inner jacket of soft, light-brown wool. The horns of the male, united and flattened at their base, curve sharply downwards, and then just as quickly curve upwards, terminating in sharp points in front of the eyes. It is a fleet and active animal, always travelling in herds, and by joint action the animals can beat off the Arctic wolf and the bear. When a herd is hunted, the animals form a circle, their glaring, bloodshot eyes restlessly watching the attack. The Musk Ox, however, is rather a stupid beast, and even when it has escaped from the foe, it cannot resist its curiosity to return to the spot to inspect any of its fallen companions. The flesh of the animal is strongly perfumed with a musky odour, but the Eskimo is not unduly particular, and the thickly haired hide makes very useful bedding in the inhospitable northern regions.

SHEEP AND GOATS

So very closely allied are the Sheep and Goats that, except with the domesticated species, it is a matter of difficulty to distinguish one animal from another. There is a marked difference between the fleece of the domestic Sheep and the hair of any Goat, but both wild species are haired alike. The wool of the common Sheep is due to man's care and selection in the breeding of the animals, and if they were allowed their freedom in a warm country, they would soon exchange their fleecy wool for a covering of hair like that of the common Goat. The beard is no real mark of distinction, for some goats have very long beards, others have none, while a few Sheep have marked beards and ruffs. The horns do not assist us unfailingly, since they are exceedingly variable in both families; in the Goats, however, the horns, which rise together just over the eyes, are erect, compressed, and curved backwards and outwards. It is sometimes asserted that the Goats always carry their tails cocked-up like their most likely forbear, the Ibex; but a glance at the Markhor, the finest of the family *Capra*, shows that the rule is not without exception. We must, therefore, look to the brief descriptions of certain selected animals together with the accompanying illustrations to assist us in the matter of their identification.

FAMILY: OVIDÆ

THE DOMESTIC SHEEP (*Ovis aries*)

From the remotest times the Sheep has been subjected to the ways of mankind, and has provided him with meat and clothing, as well as with many articles of domestic use. The animal, as we possess it, is very unlike its mountain ancestor. A wild Sheep is clothed with shortish hair, underneath which is a very slight coating of wool, imitating the down which lies beneath the feathers of many birds. In the domesticated animal the hair disappears, and the wool develops into the thick fleece. A single hair of the Sheep's wool, when magnified, presents a series of notches, somewhat resembling the edge of a saw. If loose wool is kneaded and beaten, the serrations of the hair interlock with each other, and the wool becomes felt, a dense, compact material, suitable for warm clothing. Lambskins, though of no value for their wool, are used with those of kids, or young goats, in the manufacture of 'kid' gloves.

Although the Sheep is generally considered to be a very timid animal, it is capable of considerable courage. The little Sheep that range the Welsh mountains will draw together and face a stranger with stern and unyielding gaze; and if the rams assailed him he would fare badly in the encounter. So terrible is the shock of a ram's charge, that it has been known to prostrate a



PLATE X

Urial
Barbary Sheep

bull at the first blow. In India fighting rams often provide amusement for sport-loving natives. One of these rams was put into a tiger's den as the best means of getting rid of an animal, whose vagaries were too great a trial for its owner. Of course a mere Sheep ought to have fallen an easy prey to the carnivore, but the ram at the onset so nonplussed the tiger with a tremendous butt, that he could make no headway, and in the end was killed by the furious Sheep.

Of our numerous native breeds of Sheep each possesses some more or less special point of excellence concerning the length and texture of its wool, or the quality of its flesh. In some breeds horns are present in both sexes, but in the majority of cases even the males are without them.

Of all the domesticated varieties of this useful animal, the Merino Sheep is deserving of most notice, because its fleece attains the greatest perfection.

Originally, this animal is a native of Spain, a country long celebrated for the quantity and quality of its wool; and when the breed was improved by an admixture of the Cotswold Sheep of England, in 1464, the quality of the fleece was so promoted by the crossing, that the famous English wool was surpassed by that of Spain. The Merino



MERINO SHEEP

is not a success in the British Isles, but at the Cape and in Australia it thrives wonderfully well, as shown in the vast flocks to be found on colonial pastures.

Some of the native African domesticated Sheep are clothed with hair instead of wool, and a Hausa ram, in particular, looks like a short-haired, long-tailed goat, with horns spirally twisted, but projecting largely at right angles to the head, which is not the normal style in the majority of either goats or Sheep. The Unicorn Sheep of India is poorly woolled, and has its two horns joined together to form one, except that their tips are distinct.

In several Asiatic and African breeds of domestic Sheep fat is

accumulated upon the hinder quarters in such masses that the shape of the animal is completely altered. This fat, when melted down, will yield from twenty to thirty pounds of pure tallow. Other breeds have a large amount of fat deposited in the tail. The Syrian variety (*O. laticaudatus*) not infrequently boasts a tail of seventy or eighty pounds in weight. The shepherds tie flat pieces of board to their under-surface, to prevent them from dragging the ground ; sometimes the board is provided with wheels, in order to lighten the animal's task in hauling so heavy an appendage. The fat from the tail is highly valued ; it is much employed in lieu of butter, and it is also used for pouring into jars of preserved meat to exclude the air.

THE WILD SHEEP

The Mouflon (*Ovis musimon*) of Corsica and Sardinia, the reputed ancestor of our domesticated Sheep, is a very goat-like animal, especially the ram, with its horns as long as thirty inches, and which



MOUFLON

curve backwards instead of downwards as in the domesticated sheep. Its coat of rather foxy red hair is short on the body, except on the neck and throat, and there is a light grey patch on the sides. Next to the skin is a close underwool, and Mouflon lambs, when first born, have a soft, grey, fleecy covering. If one were in doubt of the Mouflon's kinship to our domesticated breeds, the animals themselves take it for

granted. It is no uncommon thing for a wild mountain animal to attach itself to a flock of Merinoes, and a motherless tame lamb will readily accept the attentions of a wild Mouflon ewe. In summer the Mouflon frequents only the higher elevations, and it is so agile and wary that only specially good shots can secure one.

Formerly found in great numbers, the largest flocks now rarely consist of more than one ram and half a dozen ewes.

The Barbary Wild Sheep (*O. tragelaphus*), Audad or Arui, is the only wild Sheep of Africa, being found in the mountains between Egypt and Morocco, and frequenting even the treeless ranges of the Sahara. A good ram stands three and a half feet high at the shoulder, and it is of robust build. In colour it is reddish grey with a tinge of yellow, and unlike any other Sheep, has a long, shaggy beard extending from the throat and enveloping the fore-legs to below the knees. When stalked, the Arui displays a feature that is unusual with any other wild Sheep; it does not dash off over the skyline when it suspects danger, but lies perfectly still, and its colour, blending wonderfully with its surroundings, needs a lynx-eyed Arab to discover it. But when flight is necessary, the Audad is no whit behind any of its relations in seeking safety amid lofty and inaccessible precipices.

There are numerous species of wild Asiatic Sheep, of which the Argali (*O. ammon*) is the largest. It is found principally in the higher regions of Mongolia and Southern Siberia, with varieties in Tibet and Turkestan. About as large as an ordinary donkey, the true Argali is the head of the Ovine tribe. Its coat is short and coarse; it is light-coloured in summer, but in winter the hair becomes longer and takes on a reddish tinge. The horns of a full-grown male are particularly massive, covered with a series of deep grooves, set closely together. They often measure quite four feet along the curve, and at their base are about nineteen inches in circumference. An animal of only tolerable size may thus carry upon its head a weight of forty pounds. Its power of limb and sureness of foot are truly marvellous, especially taking its size into consideration. If disturbed while feeding in the valley, it makes at once for the rocks, and flies up their craggy surfaces with wonderful ease and rapidity. The Argali is one of the hardiest of animals, for it seldom descends lower than a height of 12,000 feet, and is sometimes enveloped in the deep snow-drifts that are so common in those exposed regions.

The Urial (*O. vignei*) of the Punjab is practically identical with the Sha of Ladak, and the Gooch of Persia; and Blandford's Sheep (*O. blandfordi*) of Baluchistan and Kelat is but a variety of the same animal; so that the Urial has a wider range than any other wild Sheep. It is one of the bearded species. The wrinkled horns, sweeping round boldly, sometimes attain a length of nearly forty inches, with a basal girth of about a foot; and the whole head forms a handsome trophy upon which hunters set much value.

The Bighorn, or Rocky Mountain Sheep (*O. canadensis*), is the Argali of the Rockies, where it inhabits the loneliest and most inaccessible rocks, even the young lambs following their mothers up the most forbidding cliffs. It is peculiarly shy and suspicious,

and at sight of a man the warning whistle of a sentinel sends the animals pell-mell to the recesses of the rocks. It is said that a Bighorn will leap from a height of a hundred and fifty feet without injury. Its flesh is quite equal to the finest venison, and always forms a welcome addition to the larder of the Red Indian, who gets within range of his quarry by fixing horns to his head, and thus allays the suspicions of the wary creature.

FAMILY : CAPRA

THE DOMESTIC GOATS (*Capra hircus*)

The Common Domestic Goat is a familiar animal, of which there are many varieties so unlike the original stock as to appear like different species. For ages immemorial it has been domesticated for its milk, flesh, and hair. Its coat is very variable in length, in some cases being as short as that of a horse, and in others the long hair nearly reaching to its feet ; in colour it is chiefly brown, white, or black. The male generally possesses a pointed beard, and is noticeable for a rank and powerful odour which is not present in the male sheep. The animal is unsuitable for closely cultivated regions such as our own, for it is of an adventurous disposition, and makes light of ordinary fences, and it has a great liking for bark, which makes it unwelcome where there are shrubs and young trees. In the near East immense herds of Goats are a source of great wealth, as in Biblical times ; they intermingle with sheep when on the pasture lands, but at night, or when being driven from one grazing ground to another, the animals mutually separate into distinct droves.

The Angora Goat is a native of the mountains of Angora, in Asia Minor. It is a large species, approaching milk-white in colour, with the hair hanging in long, fine, silky spiral ringlets. During the hot weather, the herdsmen wash and comb the hair to prevent it matting and deteriorating. Mohair, as it is called, was formerly imported to England *via* Constantinople and Smyrna for the manufacture of fine shawls, velveteen, plush, etc. The male has long spirally twisted horns, which suggest that it is a descendant of the markhor. This splendidly clothed animal has been introduced into various countries in the south of Europe, and in Cape Colony are vast herds that yield hair for exportation to the value of about three-quarters of a million sterling annually.

The Cashmere Goat is really an inhabitant of the high table-lands of Tibet. It has a covering of long, silken hair, with a soft, woolly undercoat to protect the animal from the winter cold. The famous Cashmere shawls are woven from the inner coat, and to make a shawl of a yard and a half square ten goats are robbed of their natural covering. One of these shawls often occupies three or four native weavers for a year, only slow hand processes being in

vogue; but European weavers, with every device at their disposal that mechanical ingenuity can conceive, produce shawls that are the closest imitation of the work of the Cashmere operatives.

THE WILD GOATS

Of Wild Goats there are many species, and almost numberless varieties; they are all fleet and agile, delighting in rocky and precipitous localities, treading their giddy heights with remarkably sure feet. The

Ibex (*Capra ibex*) is the most probable forbear of the common Goat. The European species inhabits various Alpine regions, and is remarkable for its transversely-ridged horns, three feet in length, and of such dimensions as to appear altogether unsuitable for traversing craggy heights and precipices. At one time it was commonly believed that the animal, when leaping from a great height, alighted upon its horns, their elastic strength being a safeguard against



TUR

a shock that would kill any creature not so provided by nature. The Ibex, however, relies solely upon its surefootedness in making its great leaps, and it can descend narrow clefts simply by cannoning from one side to the other.

The Ibex travels in small bands of from five to ten animals under the command of an old male. A sentinel is always stationed on the look out, and at the slightest suspicious sound, scent, or object, the troop invariably makes for the highest attainable point. Its natural environment alone renders the hunting of the Ibex exceedingly dangerous; but when urged by the reckless courage of despair it will turn upon its foe; and hunters have often been

hurled from some precipitous path to meet with their death upon the jagged rocks below.

The Tur, or Caucasian Ibex (*C. cylindricornis*), is a light-brown animal about three feet high at the shoulder. Its horns are almost cylindrical, bending backwards and outwards, their tips being only about twelve inches apart.

There are numerous varieties of Ibex in the Himalaya, South Palestine, Arabia, and Abyssinia. In the last-named region the rams are dark chestnut in colour, varied by silky grey on the sides, the underparts being white. With stout, thick horns over forty inches in length, the animal is but little known to European sportsmen, and the natives themselves have almost exterminated it.



MARKHOR

The Markhor (*C. falconeri*), an inhabitant of North-western India beyond Cashmere, Afghanistan, and adjacent mountain ranges, is generally acknowledged to be the king of the Wild Goats. The male is distinguished from all others of its race by the size of its spirally twisted horns, and its capacious beard, which extends

to the chest and shoulders. There are several varieties of Markhor, which differ chiefly in the twisting of the flattened horns, some of which attain a length exceeding sixty inches along the curve. Standing about three feet eight inches in height at the withers, the bucks are powerfully and compactly made, and are seldom killed in fair stalking, says Major Cumberland, "as they frequent very precipitous ground, and hide in caves, only emerging late in the evening to feed. The natives kill them sometimes by sitting up late, and getting a shot in the dusk, when they leave their inaccessible lairs for grazing or water." In winter, owing to the lack of underfur, the Markhor is forced to descend to the lower portions of the mountainous regions, but, nevertheless, always selecting difficult and dangerous ground. A buck exhibited in the Zoological Gardens required a heavy chain to keep it within a high-walled enclosure, and even with that disadvantage it frequently mounted to the top of the wall.

The Pasang (*C. ægagrus*) of Persia, with horns sometimes measuring over fifty inches, and the Spanish Wild Goat (*C. pyrenæica*) are typical of the family in form and habits; but there are various animals that differ very considerably from the true goats.

The Tahr (*Hemitragus jemlaicus*) frequents various forested Himalayan regions. Only emerging from cover early in the morning and late in the evening to graze on the steep grass slopes, it is exceedingly difficult for a hunter to come near it; and even when his shot takes effect very often the animal's position is such that the dead body falls thousands of feet, and is completely smashed; but this is a disappointment that often befalls the stalker of wild sheep and goats. In colour the Tahr is generally dark reddish brown; it has no beard, and the horns are seldom longer than fifteen inches.

The Nilgiri Goat (*H. hylocrius*) is a stiff-maned, rather short-horned goat, every bit as nimble in its way as the markhor. Not many years ago herds of fifty were common from the Nilgiri Hills to Cape Comorin, where this species is strangely isolated from any others of its tribe. Relentless shooting by natives and Europeans, and the heavy toll laid upon the herds by leopards, have almost extinguished what British sportsmen often call the Nilgiri Ibex.

The various species of Gorals and Serows of the Himalaya appear to link the Goats with the Antelopes. The Serow is apparently awkward in movement, but, nevertheless, its gait is that best suited to the speedy covering of bad ground. Unlike some of the preceding animals the buck will generally show fight, ever ready to dash at a hunter in defence of its mate, and sometimes beating off a pack of dogs.

The Takin (*Budorcas taxicolor*) is a native of the highest and least-known regions of Tibet, and so few specimens have been shot by

European sportsmen that only a few skins are to be found in museums. Many years ago one was captured alive after it had killed one man and severely injured another, but on its way to the coast the animal died, and only its skull and skin reached South Kensington Museum. Until the year 1909 the animal had never been seen alive in Europe, when one arrived at the Zoological Gardens, which had been captured by the Maharajah of Bhutan's hunting men, and a few Indian officials. It is a stout-limbed animal,



TAKIN

clothed with thick, coarse, brown hair ; the head is almost bovine in aspect, but the hoofs are of the true goat description, and its cry is a combination of bellow and bleat. The thick and black spiked horns shown in the photograph were longer and curved inwards at the end of a year. It is slow of movement and inoffensive in disposition, and apparently quite comfortable in confinement.

The Rocky Mountain Goat (*Oreamnus montanus*) is remarkable in being white, and as it spends a great deal of its time amid fields of ice and snow, or where patches and drifts remain almost all the year round, it is most difficult to discern one of the animals at a distance. Underneath its shaggy covering of long hair is an undercoat of wool of the finest texture, that experts declare is equal to

the best Cashmere wool. Shaving the fleece from the hide, the Indians with the most primitive looms weave excellent blankets. Stripped of its long covering, the White Goat is no larger than a good-sized sheep, and is only about a hundred pounds in weight. It is extremely agile, but not nearly so wary as many of its relations; and if the hunter has only sufficient endurance to reach its almost inaccessible home little skill is required in securing it.

FAMILY: ANTILOPIDÆ

THE ANTELOPES

The Antelopes, varying in size from that of an ox to less than that of an ordinary sheep, form an important group of animals that is represented in many parts of the globe. Though they resemble the deer in many respects they are easily distinguished from those animals by the character of their horns, which are hollow at the base, and are set upon a solid core like those of the oxen; and, unlike the deer, the Antelopes retain their horns throughout their entire life. The horns, and in many cases both sexes are furnished with them, rising from above the eyebrows, are either simply straight and conical, and more or less twisted; or are hooked backwards, and often so bent as to resemble the two horns of the ancient lyre, and in technical language are termed 'lyrate.' Clothed with sleek and close hair, the Antelopes possess light and elegant bodies set upon graceful and slender limbs, which are furnished with small cloven hoofs. Vegetable feeders, inhabiting open plains, and in many cases very barren regions, their sight, hearing, scent, and speed are their sole means of defence. Their flesh, though often dry, is excellent eating, and is eagerly sought by the natives of the regions where these fleet creatures make their home. There are about a hundred species of Antelope, quite ninety of which inhabit Africa. There are a few kinds in Syria, Arabia, India, Tartary, and Tibet, but the New World does not possess a single true Antelope.

THE CHAMOIS (*Rupicapra tragus*)

Though very goat-like in form and many of its habits, the Chamois is a true Antelope. It is chiefly found in the Swiss and Transylvanian Alps and the Carpathians, and there are varieties in the Pyrenees, Greece, the Caucasus Mountains, and Georgia. It is a gregarious animal, frequenting the most elevated forested regions, but in the summer not a few of the animals leave the usual herds of from fifteen to a score, and betake themselves to the borders of the glaciers and snowfields.

The Chamois is swift upon level ground, and is unsurpassed in traversing the precipitous Alpine passes of its native home. It has the power of scenting man at an incredible distance, and a half-obliterated mark of a human foot in the snow is sufficient to divert

the course of an animal, when in mid-career down a mountain slope ; and its ears being equally acute, there are few animals more difficult of approach than the Chamois. Only those with a quiet pulse and



CHAMOIS

steady head, who have been trained to climb the giddiest heights, and pick their way along the most treacherous paths, and to endure terrible hardships amid rock, ice, and snow for perhaps days at a time, can hope to come within even long rifle range of this wary mountain antelope. Thanks to its false hoofs, it can take enormous leaps, or slide twenty or thirty yards down the face of an almost perpendicular cliff, and make good its footing on the first narrow ledge that presents itself.

The Chamois is only about two feet in height. It is mainly dull reddish brown in colour, with a

dark stripe on the back, and the head and hind-quarters varied with white. The horns rise straight from the head, and then suddenly curve backwards to form a pair of sharp hooks.

THE ELAND (*Taurotragus oryx*)

The Eland, or Impofo, the largest of the Antelopes, is about equal in bulk to the domestic ox. A fine adult bull stands nearly six feet high at the shoulders, and is heavily burdened with fat and flesh. Animals weighing half a ton are quite common, and old bulls are nearly double that weight ; and, as may be supposed, these heavier animals can usually be ridden down in the open plains without much trouble. Indeed, the chase of the beast is often so simple a matter that the hunters contrive to drive it towards their encampment, reserving their shots until they will be put to little labour in conveying the flesh and hide to their stores.

The flesh of the Eland is peculiarly excellent when the animal is in good condition, and it is highly appreciated in the interior of

South Africa, where, usually, all the meat is as tough as shoe-leather, and nearly as dry. In some strange manner the Eland contrives to live for months together without drinking, but for its abstinence in liquids it compensates by its ravenous appetite for solid food, which is a complete bar to any idea of domesticating it for the sake of its flesh.

During the rainy season the Eland forms into small herds of less than a dozen animals, but towards the end of the dry season these small parties unite to the number of several hundreds. In many districts between the Cape and the sources of the Nile this fine Antelope has now completely disappeared, not altogether so much the result of overhunting as the ravages of rinderpest, which destroys many animals in South African regions.

THE GEMSBOK (*Oryx gazella*)

There are several species of Antelope of the genus *Oryx*, each possessing long horns, that slope backwards with very little curve, nearly in the plane of the face. The Gemsbok, the largest and handsomest of the group, chiefly ranges the Kalahari region. It stands four feet high and is about the size of the domestic ass. In colour it is mainly greyish, with dark patches on the hind-quarters and fore-legs, and its face is banded with black and white. Both sexes are horned; those of the female have been known to attain a length of forty-eight inches.

The long and sharply pointed horns with which the Gemsbok's head is armed are terrible weapons of offence, and can be wielded with marvellous skill. Striking right and left with these natural bayonets, the adult Gemsbok is a match for most of the smaller carnivora, and has been known to wage a successful duel with the lion, and fairly to beat off its antagonist. In one instance the dead bodies of a lion and a Gemsbok were found lying on the plain, the horns of the Antelope being driven so firmly into the lion's body, that they could not be extracted by the efforts of a single man. The beast of prey had evidently sprung upon the Gemsbok, which had received its foe upon the points of its horns, and had sacrificed its own life in destroying that of its adversary.

The Gemsbok is not a particularly fleet animal, and it is possible for a hunter to run it to a standstill on foot. It must be remembered that the home of this Antelope is in very barren regions, and under a burning sun; and if the quarry is almost, if not quite, independent of water, the hunter is not so well endowed.

The Beatrix Antelope (*O. beatrix*) of Southern and Western Arabia is much smaller than the foregoing animal, standing less than three feet in height, and with horns not exceeding eighteen inches in length. This smaller *Oryx* is wary, fleet, and enduring, and when pursued on horseback maintains a steady gallop for a long distance.

When wounded, any animal of this species must be approached with caution, lest it should suddenly strike at the hunter



BEATRIX ANTELOPE

with its long, keenly pointed horns, while its body lies prostrate on the earth. Should it be standing at bay, it is a very dangerous opponent, having a habit of suddenly lowering its head and charging forward with lightning-like speed, from which its antagonist cannot escape without difficulty.

The Beisa Antelope (*O. beisa*),

inhabiting the north-east of Africa, especially Abyssinia and Somaliland, is in all probability the animal that in ancient times gave rise to the fabled unicorn.

THE NILGAI (*Boselaphus tragocamelus*)

The Nilgai, an inhabitant of the forested regions of India, is a magnificent antelope standing about four and a half feet high at the shoulders. The general colour of the male is a slate-blue, and hence its common name, 'Blue Bull,' although the old animals are more nearly black. The face is marked with brown or sepia; the neck is furnished with a bold, dark mane; and a long tuft of coarse hair hangs from the throat. The hind legs of the animal are slightly shorter than the fore limbs, giving it rather a clumsy appearance that is belied by its rapid gait, especially upon tussocky ground, and among thick-growing reeds. It is shy and wary, and the hunter requires to be a good marksman as well as a good stalker, for the Nilgai is very tenacious of life, and if not struck in the proper spot, will carry off a heavy bullet without appearing to be much the worse for it. Hunting the Blue Bull is not without its excitements, for its temper is of the shortest, and when it feels aggrieved, it suddenly turns upon its opponent, drops on its knees, and leaps forward with such astounding agility, as to give its intended victim little chance of avoiding the attack. The bulls are much given to fighting with each other, and in their duels the shock of their



PLATE XI

Springbok
Eland



contending heads would be sufficient to crack the skulls of many animals. Some sections of the Hindoo community classify the animal among the oxen, and refuse to kill or eat it, but in any case its flesh is rather coarse and flavourless. Sometimes the Nilgai is domesticated, but its irritable temper is not to be depended upon, and instances are known where it has killed its owner.

THE SABLE ANTELOPE (*Hippotragus niger*)

The Sable Antelope is a South African animal, but is very shy and speedy, and keeps itself aloof from civilisation. Gordon Cumming considered it to be the rarest and most beautiful animal



SABLE ANTELOPE

in South Africa, and nowadays it is still more scarce, though within very recent years herds of from fifteen to fifty have been met with in Mashonaland. Its back and sides are of glossy black, beautifully contrasting with the belly, which is as white as driven snow. The scimitar-shaped horns are often forty inches along the curve, bending strongly back with a bold sweep, and sometimes they are fifty inches. The horns of the female are a foot shorter. The buck generally takes matters rather easily, trusting to the does to keep a good watch, and right well these female sentries carry out their duties. At the least sign of danger the herd will bound over

the roughest ground with such matchless speed that pursuit is generally hopeless. When wounded, the Sable Antelope is extremely savage, and a pack of dogs often has occasion to remember the encounter. Mr. Selous once brought an animal to bay that killed three dogs with consecutive sweeps of its horns, and upon another occasion four dogs were killed and four badly injured in as many minutes.

THE GAZELLE (*Gazella dorcas*)

There are many species of Gazelle, all of them small or only of moderate size, and chiefly inhabiting the desert regions of Northern Africa, Palestine, Arabia, various parts of Asia Minor, and Central



DORCAS GAZELLE

Asia. One of the best known is the Dorcas Gazelle, which ranges from Algeria, through Northern Africa to Asia Minor. It does not exceed two feet in height at the shoulder, and the lyrate horns average about twelve inches in length. The colour of the pretty creature is a light fawn above, deepening into a dark band to separate it from the pure white of the abdomen; the face is marked with two streaks, one blackish brown and the other white, and the hind-quarters also show a

considerable amount of white. The eye of the animal is large, dark, and lustrous, and has always been celebrated in Eastern poets' song as the most flattering simile of a woman's eye.

The Gazelle collects in herds of considerable size, and is always hunted assiduously by man and beast. Thanks to its long and slender limbs, the animal is enabled to skim across the sandy plains where it dwells with wondrous celerity, and even the lion and leopard cannot hope to overtake it, if they fail to spring upon it unawares. Indeed, its swiftness is so great that greyhounds are of little use in the chase, and Arab hunters frequently use trained falcons to retard and confuse the fugitives until the dogs can come up. The Gazelle is easily tamed, and is frequently seen domesticated in the courtyards of houses in Syria and Northern Africa.

THE SPRINGBOK (*Gazella euchore*)

The Springbok is easily distinguished from all other Gazelles by the stripe of snow-white hair running along the middle of the back, the face is whiter, and the white patch on the hind-quarters more pronounced. It is found in various South African regions, but is most abundant about the borders of the Kalahari Desert. It receives its name from its habit of leaping into the air from seven to twelve feet when running, at the same time curving its back in a most extraordinary manner. The lyrate horns, twelve to fifteen inches in length, are ringed almost to their tips. The most remarkable fact in the life history of the Springbok is its habit of making periodical migrations, one of which made a deep impression upon Gordon Cumming :—

“ I had the satisfaction of beholding for the first time what I had often heard the Boers allude to, viz., a ‘ trek-bokken.’ For about two hours before the day dawned I had been lying awake in my waggon, listening to the grunting of the bucks within two hundred yards of me, imagining that some large herd of Springboks was feeding beside my camp ; but on my rising when it was clear, and looking about me, I beheld the ground to the northward of my camp actually covered with a dense living mass of Springboks, marching slowly and steadily along like the flood of some great river. The breadth of the ground they covered might have been somewhere about half a mile. I stood upon the forechest of my waggon for nearly two hours, lost in wonder at the novel and wonderful scene which was passing before me, and had some difficulty in convincing myself it was reality which I beheld, and not the wild and exaggerated picture of a hunter’s dream.”

Upon another occasion the famous hunter calculated that hundreds of thousands of Springbok were in view at the same moment. Flocks of sheep and goats belonging to the settlers have sometimes been resistlessly carried away in a ‘ trek-bokken ’ ; and it is said that lions and other beasts of prey get enveloped and have perforce to go with the tide of living animals. Various reasons have been put forward for the migrations of the Springbok. It is stated that after long abstention from water the Antelopes become afflicted with a raging thirst, and set off towards the sea-coast to quench it ; others believe that the hosts of animals are out in search of young grass ; while Livingstone suggested that, when ordinarily bare regions become covered with tall grass, the creatures seek fresh quarters where their view of the surrounding country is less impeded. But there is no gainsaying the fact that the ‘ trek ’ is generally in the direction of the sea, and many thousands of Springbok have been known to quench their thirst with salt water and die upon the shore.

THE WATERBUCK

Unlike any of the preceding Antelopes, the Waterbucks are water-loving animals. For the most part they frequent swampy plains, where tall grass and reeds afford them ample cover; and though they are sometimes found in stony regions they always make for water when pursued. They do not attempt to swim as long as they are within their depth, but splash along in a series of high bounds. Living usually in small herds of not more than a score of animals, under the leadership of only one full-grown male,



SING-SING WATERBUCK

the Waterbucks spend much of their time standing knee-deep in water, while they are cropping aquatic plants, and thus not a few of them fall victims to the crocodile. The largest Waterbuck (*Cobus ellipsiprymus*) ranges the regions between the Limpopo and Somaliland. Varying from reddish brown to grey, it stands four feet high; only the male possesses horns which are slightly lyrate, ringed, and over thirty inches in length. The Sing-Sing (*C. defassa*) of Senegal, Gambia, and Central Africa, is a slightly smaller animal, with fine, soft hair, instead of the coarse covering of most of its nearest relatives.

THE HARTEBEEST (*Bubalis caama*)

The Cape, or Red, Hartbeest is the finest of nine species that are found in different parts of Africa from north to south; its home is chiefly in the region south of Mashonaland. Standing about four feet in height at the withers, or nearly five feet in the case of old bulls, the colour of the coat is a brown bay, darkening into purplish on the back; the face is long and narrow; and the

corrugated horns curve slightly forwards and then suddenly backwards, and are very rarely longer than twenty-four inches. Owing to its high withers the Hartebeest at first sight appears to be a cumbrous animal; but it is really not only speedy, but very enduring. A hunter on horseback cannot wear it down, for after a hot chase of seven or eight miles the Antelope will still be going with the tireless energy of a machine. Even with a broken leg, or a bullet in its lungs, often finally it will make good its escape. Indeed, it would rarely fall to the hunter, but for its habit of occasionally wheeling round to take stock of its pursuer, thus affording an opportunity for a long-distance shot; but most Antelopes, when in full flight, can be turned by dropping a bullet ahead of them, and then the hunters not infrequently contrive to cut through the herd, confusing the separated animals, and thus rendering them rather easy victims.

Able to exist without water for long periods, and chiefly frequenting desert regions, this species is not likely to suffer extinction within the immediate future. In Griqualand West the herds are protected, and only judiciously thinned at regular intervals, and in Khama's country troops of fifty animals may be encountered, although the number is more usually nine or ten. Other species of Hartebeest are common in the Nile regions, south of Fashoda, and in the neighbourhood of Lake Rudolph they exist in thousands; quite recently a traveller saw a herd numbering at least four hundred.

The Blesbok (*B. albifrons*) is a very near relative of the Hartebeest. It is a robust animal, about three feet six inches in height. It is the most beautifully coated of all the antelopes, being mainly various shades of warm brown, tinted with purple and lilac, which are admirably thrown up by the white blaze on the front of the long face, and the snow-white underparts. The skin is said to give off the perfume of flowers and sweet herbs upon which the animal feeds. Gordon Cumming once saw "a purple mass of graceful Blesboks, which extended without a break as far as the eye could strain." The Boer skin-hunters, even before the South African war, had reduced the numbers of this Antelope to a few thousands; and only a few remnants of the once vast herds now remain.

THE GNUS

Of all the Antelopes the Gnu is the most remarkable in appearance, for at first sight it seems to be an admixture of horse, bull, and Antelope. There are several species, but each possesses a fierce-looking head, with a broad nose very unlike the typical antelope. The horns are of peculiar shape, bending downwards and then upwards again with a sharp curve. The neck is furnished with a mane like that of the horse, and there is a ruff of shaggy hair sometimes extending from the chin to between the fore-legs.

The Gnu is irritable and suspicious, timid and curious, and displays these mingled qualities very grotesquely when any strange object alarms it. "When the hunter approaches the old bulls,



BRINDLED GNU

they commence whisking their long tails in a most eccentric manner ; then, springing suddenly into the air, they begin prancing and capering and pursuing each other in circles at their utmost speed. Suddenly they all pull up together, to overhaul the intruder, when two of the bulls will often commence fighting in the most violent manner, dropping on their knees at every shock ; then quickly wheeling about, they kick up their heels,

whirl their tails with a fantastic flourish, and scour across the plain enveloped in a cloud of dust." It is its odd appearance and its quaint evolutions that have gained for the animal the name, 'Wildebeest.'

The White-tailed Gnu (*Connochætes gnu*), or Black Wildebeest, formerly ranged the Karroo north of Cape Colony, the plains of the Boer republics and adjacent regions. When the war broke out there were in existence not more than five hundred animals, and those were under the protection of the Boer farmers ; but nothing like that number remain at the present time.

The Blue, or Brindled, Wildebeest (*C. taurinus*) is not found south of the Orange River, but ranges from Bechuanaland to British East Africa. It is a slaty-drab animal, varied with dark stripes. In some of the plains the scattered herds will total up to several thousand head. It is wary and fleet, and exceedingly difficult to stalk in open country ; but where the hunter can take cover amid scrub or ant-heaps, it is possible to get a shot at about two hundred and fifty yards. Wherever the Gnu is found, it is generally impossible to run it down in a tail-on-end chase.

MISCELLANEOUS SMALL ANTELOPES

It is impossible to mention a tithe of the larger Antelopes, but even a brief description of the family would be incomplete without reference to a large assemblage of pretty, dainty little animals, not a few of which are imperfectly known, because they inhabit dense forests, and are mainly nocturnal in habit.

The Klipspringer (*Oreotragus saltator*), an active little Antelope, is found throughout East Africa, from the Cape to Abyssinia. Unlike most of its tribe, it is only met in twos and threes, and often its home is in rugged, mountainous regions, 10,000 feet above sea-level. In colour the coat of the Klipspringer is yellowish brown, with a slight tinge of green, and only the males have horns, which are not more than five inches in length. Its hard hoofs are so small that the beautiful little animal is enabled to obtain a foothold on any rocky projection that presents a space as big as a penny. It may often be seen perched on some narrow point of vantage, standing like the chamois, with all its feet drawn closely together, and calmly surveying the prospect from a height which would prove instantly fatal were one of its feet to miss its hold. When startled, it dashes at once at the most precipitous rocks that are within reach, and bounds up their apparently inaccessible faces as if it were an india-rubber ball endowed with sudden vitality.

The Duikers comprise quite a score of species that are found in various regions south of the Sahara. The Common Duiker (*Cephalophus grimmii*) is only twenty-one inches in height at the shoulder, but it is two inches higher at the croup. The general colour is yellowish brown. It is a rather solitary, sneaking animal. When it is observed it will crouch in the long grass, or behind a bush, and will crawl under foliage until it can bound away safely. In the course of its flight it makes so many sharp turns and leaps that even dogs are frequently baffled. The little Blue Duiker (*C. monticola*) of Cape Colony and South-east Africa only attains a height of fourteen inches at the shoulder, and its hare-like body is supported on very slender legs. Bluish grey in colour, it is a jungle-loving animal, and seen only in the early morning and evening.

The Four-horned Antelope (*Tetraceros quadricornis*) is an Indian animal, and is remarkable among ruminants for the fact that the male usually has four horns, a small pair, often mere knobs, and never longer than three inches, quite close to the eyes, backed by a pair that may be four and a half inches long. It is pale brown above, and lighter beneath. It is almost hare-like in its habits, seldom to be seen grazing. Usually it lies close until it is almost kicked up by the hunter, when it will set off at a great pace.

The Dik-Dik Antelope is another small creature, not exceeding fourteen or fifteen inches in height, with small, straight horns

three inches long, and a tuft of hair on the crown of the head.



DIK-DIK ANTELOPE

Its total weight is only about eight pounds. One of its characteristic features is its elongated nose, which is distinctly hairy. There are various species in East and West Africa, and in Abyssinia. In a wild state these pretty little creatures seek cover in well-bushed ground near rivers. They are not gregarious; usually seen only in couples. The animal depicted in the photograph is Phillips's Dik-Dik (*Madoqua phillipsi*); it makes a charming little pet, and is always much admired by visitors to the Zoo.

The Royal Antelope (*Neotragus pygmaeus*), the tiniest of the family, frequents the bush country of West Africa. The buck is less than a foot in height, and its sharply pointed horns are less than an inch in length. In colour it is chiefly reddish fawn with the underparts pure white.

FAMILY: ANTILOCAPRIDÆ

THE PRONGHORN ANTELOPE (*Antilocapra americana*)

The Pronghorn Antelope, or Prongbuck, is the only Antelope of America, but differs so much from any of the preceding animals in two important respects, that it is referred to a distinct family of which it is the sole representative. The peculiarly distinguishing characteristic of the buck rests in its horns, which are branched and shed annually, instead of being simple and retained permanently; usually the female is hornless, but when she is furnished with head-gear, the horns are not only smaller, but are not pronged. The black and flattened horns, which curve backwards only slightly at the tips, where they take a yellowish tinge, are usually about twelve inches in length, but specially fine ones may attain seventeen inches. For a long time naturalists refused to believe the statements of hunters that the Prongbuck shed its horns, but when an animal, consigned to the Zoological Gardens, gave positive proof of the peculiarity, discussion was silenced.

In America, and it is commonest in California and Oregon, the Prongbuck is simply called the Antelope. It is shy and timid; but although it is the swiftest of the New World ungulates, it cannot keep up a fast pace for any great length of time. It is a remarkably poor jumper, probably because its habitat is usually very open country. Sometimes, on the prairie railroads, an on-coming train will alarm a band of animals, who strain every nerve to outrun the monster and pass ahead of it, as if suspecting a purpose to cut them off from crossing; "and thus many an exciting race has been witnessed between muscle and steam."

The Prongbuck averages about three feet in height at the shoulder, and its lightly and gracefully built body is clothed with brittle hair, chestnut in tint with the underparts white, which colour is also present round the eyes, ears, cheeks, and chin, showing well against the brownish-black face.

FAMILY: CAMELOPARDALIDÆ

THE GIRAFFE (*Giraffa camelopardalis*)

There are ten varieties of Giraffe, but only two species: one ranges from the borders of Cape Colony through British East Africa to the Sudan, and the northern species is found in the region between Abyssinia and the Nile. The southern animal has short, close hair, creamy fawn in colour, and marked irregularly with patches of darker fawn and brownish black, with a general resemblance to the coat of the leopard. Upon the top of the head are two horn-like excrescences, which are merely growths of certain bones of the skull. They are covered with skin, and are tufted with dark hair. The Nubian species is more reddish chestnut in colour, forming the groundwork for a series of almost geometrical tawny lines, and very often it has a third horn in the centre of the forehead.

The Giraffe appears to be a graceful admixture of the antelope, deer, ox, camel, and ostrich. It is easily understandable why it is called the Camelopard, but its full, round, dark, expressive eye shows that it has nothing in common with the fierce carnivore. It is the tallest of all living animals, a full-grown male attaining to eighteen or twenty feet, the female being a little shorter. A great part of its enormous stature is obtained by the extraordinarily long neck, which, nevertheless, is possessed of only seven vertebræ. There is thus practically no flexibility in the long, tapering neck, and the animal can only drink or graze by much awkward straddling of the fore-legs. Its height, however, regulates its habits in the matter of food, and it browses upon the leaves of trees, especially the acacia, and in consequence the skin of the animal not infrequently gives off a powerful odour not unlike the scent of a hive of heather honey. The upper lip is very mobile, and the long tongue

has such prehensile power that the animal is able to pluck a selected leaf with perfect ease. In captivity it exhibits a liking for hay and carrots.

Despite its great size the Giraffe is by no means a conspicuous animal, for its colouring closely resembles the dried stems of the



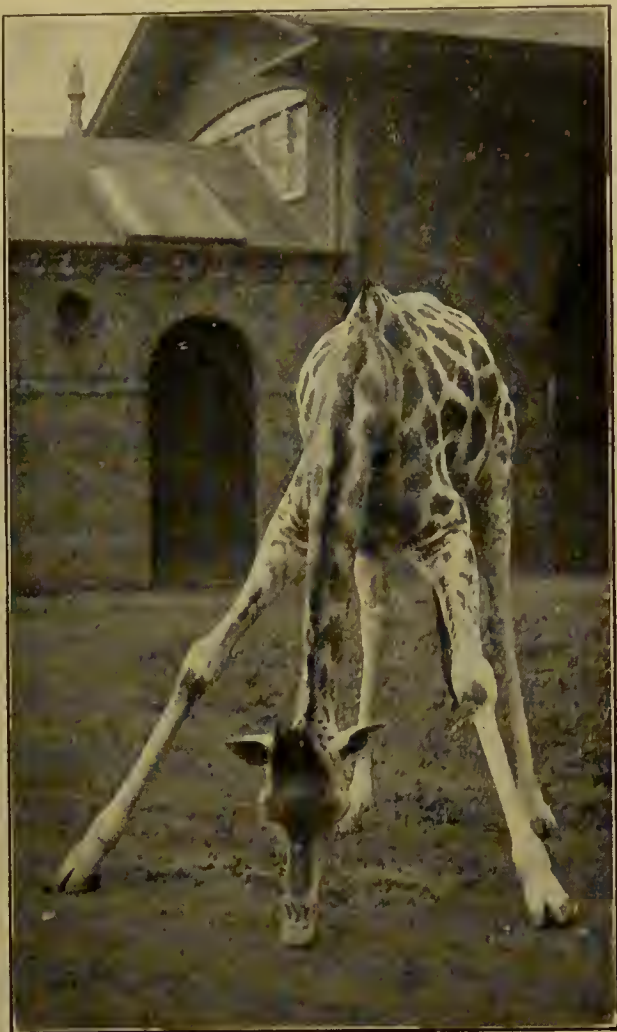
GIRAFFE

forest trees. Out in the open it is a different matter, especially as the animal is generally found in herds of from six to twenty, but usually in the vicinity of forests. It is only moderately swift on level ground, and after a burst of two miles can be worn down by a horse ; but on a rough track the advantage lies with the Giraffe. When running, it swings the two legs of the same side forward at the same moment, producing a swinging motion which, in conjunction with the stiff rocking of the long neck, completes a gait

that is almost ludicrous, even though it is correspondingly effective.

The Giraffe is a gentle and inoffensive creature, but when attacked by some predaceous animal it delivers a shower of kicks, that not infrequently daunt even the lion. The latter, however, usually steals upon its prey unobserved, and when it can once spring upon its tall quarry, it bears it to the ground by sheer strength, and the fiercely working tooth and claw. At all times the Giraffe is a strangely silent animal; in its sport and play, or when startled, it utters no sound; nor does it give vent to a moan of pain when it is in the clasp of a lion and in the agonies of death.

With the opening up of vast regions in South and East Africa, the Giraffe has not become in danger of extinction. It has but retired to the pathless wilds where its human enemies cannot follow it on account of the lack of water; for, like some of the antelopes, the Giraffe can obtain sufficient moisture from its food, as to allow it to go for long periods without quenching its thirst. The Giraffe thrives well in captivity. The first living animal that came to Eng-



GIRAFFE IN GRAZING OR DRINKING ATTITUDE

land was a present to King George IV. In 1836 four Giraffes from Kordofan were installed in the Zoological Gardens, but one of them killed himself by striking his head against a wall, when he was rising from the ground. It would seem that a blow upon the head is more effective than a bullet in some parts of the body, for the hide is nearly an inch thick, and unless the bullet strike a vital part it will take more than one shot to stop its career. From the remaining captives and their descendants seventeen young Giraffes were bred in the course of time, this particular stock not dying out until 1881. Other examples from Kordofan and

Nigeria now in the Gardens appear likely to be as long-lived, and possibly as prolific as some of the earlier captives. A young one was born in June, 1910. The mother displayed the most callous indifference towards her baby, which was six feet in height. Fortunately Peter Pan, as he was called, took readily to a bottle, but, nevertheless, he lived only a few weeks.

THE OKAPI (*Okapi johnstoni*)

The fact that after long years of waiting a takin is now in captivity at the Zoological Gardens, leads one to hope that an Okapi may speedily follow suit. Sir H. M. Stanley was the first to report an unknown animal in the Semliki forest; he had not seen it



OKAPI

himself, but the dwarf people of that little-known region told him of an animal, something like an ass, which they captured in pits. Over ten years elapsed before Sir Harry Johnston got upon the track of the animal, which was then described as a mule with zebra stripes. Notwithstanding all his efforts, he was only able to obtain from the natives the skin of the mysterious beast, which was duly

lodged in the South Kensington Museum, where several stuffed specimens may now be seen. No white man appears to have yet set eyes upon the Okapi, and the advent of a live animal would excite positive enthusiasm.

The Okapi is an extraordinary-looking beast. Its head is giraffe-like in shape, with two very short curved horns just above the eyes, and its body reminds one very much of the hartebeest. The legs are clean and slender, the hoofs are neat, and there appears to be little doubt that the creature is capable of considerable speed. Its colour is mainly a purplish brown, with transverse stripes on the hind-quarters, thighs and fore-legs.

It may not be out of place to consider for a moment the most dangerous sport in the world, namely, capturing big game alive. As an occupation it is a mere gamble with death, and the monetary results are always doubtful, and often microscopically small compared to the delirium of danger in which the hunter is always engaged. Captain Fritz Duquesne tells us that the prices of wild animals naturally fluctuate with the demand. Five rhinoceroses for sale at any time in the world would glut the market, for one cannot sell a rhinoceros any day. The maintenance of wild animals is costly, and they soon eat their value in food; so that every day they are on the hunter or dealer's hands he is losing money.

Capturing the animals, difficult as it is, is only the commencement of a tedious business. They have to be transported to the coast, which adds greatly to their cost. Delivered at Nairobi or Port Florence, which are inland and practically on the African big-game hunting-field, a giraffe will bring from £50 to £100 sterling, and a baby hippopotamus nearly as much; elands, and most of the larger antelopes, from £25 to £40; monkeys and baboons from 5s. to 25s.; elephants from £75 to £175, and lions and leopards from £20 to £35, according to their size and condition. The gorilla and the white rhinoceros can be sold at auction by telegraph, and their value might run from £1000 to £6000. These prices are doubled by the time the animals reach the coast; and then there is the cost of transport from Africa to London, Antwerp, or Hamburg, with the cost of food and care added. It is quite certain that the hunter who succeeds in capturing a live Okapi will not lack for bidders, and the price will certainly not be less than that offered for a gorilla.

THE SOLID-HORNED RUMINANTS

FAMILY : CERVIDÆ

THE DEER

The family Cervidæ contains some of the noblest mammals on the face of the globe. Most of them are elegant of form and speedy of foot. The males are readily distinguished from the antelopes by their horns, which are called antlers, and are composed of solid bony substances, that are shed and renewed annually during the life of the animal. The process by which the antlers are developed, die, and are shed is a very curious one, and is well exemplified in the Stag or Red Deer of Europe. In the beginning of March he is devoid of antlers, and is as timorous and harmless as his mate. Soon there appear upon his forehead two excrescences, covered with a velvety skin, through which the blood courses strongly, and rapidly deposits bony matter until the whole is complete. When the antler has reached its full growth, the velvet is very tender and, if wounded, will bleed profusely ; but a ring of bone forms round the root of each antler, gradually constricting the blood vessels until the supply of nourishment ceases altogether. The velvet speedily loses its vitality, dries up, and the animal removes it in shreds by rubbing the antlers against tree trunks. These bony ornaments vary very considerably at different periods of the animal's life, the age of the Stag being well indicated by the number of ' tines ' upon his antlers. Deer never frequent hot, arid regions, but prefer rich pasturage and forests. On the whole their coats present some shade of brown, but in many cases the young animals are spotted or striped with white for the first year of their life. The family comprises a score of species and very many varieties, but to describe the chief differences between many of them would involve details altogether too technical for inclusion in a brief review of a few representative animals.

THE RED DEER (*Cervus elaphus*)

The Stag, or Red Deer, is indigenous to the British Isles, and is spread over many parts of Europe ; in Asia the species is represented by various animals, such as the Maral of Persia, and the Hangul, or Cashmere Stag. The colour of the Red Deer is a warm, reddish brown in summer, changing into a greyish hue in winter ; the young, which are born early in June, are mottled with white upon the back and sides. The hind conceals her fawn amid the heather, where it will never stir or lift up its head the whole of the day, lying like a dog with its nose to its tail. The mother does not lose sight of her offspring, but remains at a distance to windward, and goes to its succour in case of an attack by the wild cat or fox, or any other powerful vermin.

The young male is known as a 'Knobber' until it is a year old, when it obtains a pair of unbranched antlers, and becomes a 'Brocket.' The next year the new beam throws out a brow tine, and the animal, now in its third year, is called a Spayad. In the year following appears the 'tres' tine, an extra front branch, followed a year later by the 'bez' tine between the brow and tres tines; and the top of the beam bifurcates into the 'sur-royals.' The 'Staggard,' as the animal is now termed, possesses antlers of



RED DEER

at least five points each. During the next few years the sur-royals throw out snags until the full adult, a Royal Hart, may wear antlers three feet in length with as many as twenty points, and weighing 70 lbs. the pair. Sometimes the points exceed forty.

Formerly the Stag in our country was placed under the protection of the severest penalties, its slaughter being visited with capital punishment on the offender if he could be known and arrested. Indeed, a man who murdered his fellow might hope to escape retribution except by the avenging hand of some relation of the slain man, but if he were unfortunate enough or daring

enough to dip his hands in the blood of a Stag, he could hope for no mercy if he were detected in his offence.

The Red Deer is now found only in the Highlands of Scotland, Exmoor Forest, and in Kerry and Connemara. Perthshire produces the finest of our native animals, robust woodland stags, standing four feet high at the shoulders, and often weighing twenty-five stone, though one shot in Inverness-shire turned the scale at thirty. The chase of the Red Deer is the finest of all British wild sports. In Scott's "Lady of the Lake" is an unrivalled account of a deer hunt from the moment that the quarry "tossed his beamed frontlet to the sky, and stretching forward free and far, sought the wild heaths of Uam-Var" until, after a stern chase over "mountain and meadow, moss and moor," the "labouring Stag" sought sanctuary, in the deep Trossachs' "wildest nook."

Nowadays, stalking is the chief means employed in Scotland, but hounds are still used in Devonshire, where fifteen to twenty years ago the Red Deer had increased to such numbers as to call for their thinning in the interests of the farmers, whose crops were suffering continually from the roaming herds. In one season nearly four hundred Deer were run down by the several packs of hounds that hunt the Exmoor district.

The Red Deer of the Continent are usually much finer animals than our own, but even in the best Deer preserves cannot now be found such Stags as were killed in Saxony in the first half of the seventeenth century, when 4000 animals each exceeded 32 stone, 2600 exceeded 40 stone, 650 exceeded 48 stone, 59 exceeded 56 stone, and one magnificent Stag turned the beam at 62 stone. Mr. Baillie Grohman, who quotes these figures in "Big Game Shooting" of the Badminton series, says that 40-stone Stags, with beautiful heads, are still shot in the Carpathian regions, where the great territorial magnates exercise such feudal sway that the agriculturists suffer the Deer "to trespass upon their crops with impunity, and thus grow to be the lustiest of their race."

Strangely enough, the only Red Deer to rival the great Stags of Central Europe are those of New Zealand, to which colony the Prince Consort sent a few specimens with a view to their acclimatisation, and a little later Australia contributed a few more of British stock. They have thrived wonderfully, and have now become a permanent addition to the wild fauna of New Zealand.

THE WAPITI (*Cervus canadensis*)

The Wapiti, the Red Deer of America and the giant of the group, may attain a height of more than five and a half feet in the adult male, and a weight of a thousand pounds. A good average animal carries antlers with a dozen to fourteen points, but the finest specimens measure five feet in length, and may have as many as twenty points. In size, form, and bearing, and its horny adornment,



PLATE XII

Wapiti Deer
Axis Deer

the Wapiti is the lordliest of the tribe. At one time it inhabited the forested regions of Mexico, United States, and British North America, as far north as the Great Slave Lake, but the advance of civilisation has told its tale, and the noble animal is now found chiefly in the Rocky and Cascade mountains and adjacent regions. The Wapiti, or Elk, as it is often wrongly called, is a capital swimmer, and even when young will fearlessly breast the current of a wide and rapid river. It is a good runner and, although burdened with its large and widely branching antlers, can charge through its forest haunts with ease, its head well back, laying its antlers on its shoulders, and shooting through the tangled branches like magic.

The combats that take place between the males are of a singularly fierce character, and often end in the death of the weaker competitor. Sometimes their antlers become inextricably locked together, and both combatants die of hunger and thirst. These combats usually take place during the pairing season. "The challenger," says Mr. Perry, "when approaching a band, blows a loud whistle of defiance, which is at once answered by the ruler of the herd, who steps boldly forth to do battle with the intruder. With heads lowered between their fore-feet, the two adversaries walk around waiting for an opening, and when one is thrown off his guard the other makes a savage rush; but his opponent instantly recovers, counters the charge, and as they rush together the antlers strike each other with such terrific force that the report can be heard for a long distance. Slowly retreating, bellowing, grumbling, and grinding their teeth in a paroxysm of rage, they again circle around, and when an opportunity is afforded, make another charge, which is countered as before. The challenging Wapiti usually does most of the offensive fighting until he finds that he is the weaker; then he sullenly retires, bellowing as he goes."

In Turkestan and the Altai regions of Asia are very similar animals, which fact suggests that the American Wapiti originally reached the New World by way of Behring Strait.

THE AXIS DEER (*Cervus axis*)

The Chital, Axis, or Spotted Deer, inhabits the jungly regions of the greater part of India, being wholly a forest dweller, and congregating in herds, bucks and does together, whereas in most species the sexes form separate herds, except in the pairing season. Its coat is generally a rich golden brown, with a dark stripe along the back, and a white streak across the haunches; and the back and sides are spotted with white in completion of a covering that renders the animal one of the most attractive of the Cervidæ. This apparently conspicuous coat makes a rather uncertain mark for the hunter, for it well harmonises with the tints of the vegetation, and the flecks of sunlight that pierce the foliage. Its antlers are

three-tined, with not infrequently a number of 'sports' where the brow tine leaves the beam; they vary in length, but fine antlers run from thirty to nearly forty inches in length.

When hunted, the Chital lies up close, and breaks away only at the last moment; but the hunter must needs be specially cautious, for almost wherever there are Deer, there also is the tiger. When the Deer suspects the presence of the carnivore it gives vent to a kind of shrill bark, and this cry is often the cue to the sportsman that the huge cat is in his vicinity. General Kinloch says that when the Chital is disturbed it attempts "to elude observation by concealment, or trying to sneak quietly away. I have often, when beating for tigers, seen a cunning old stag, with his head down, passing almost under the elephants."

The Axis Deer, because of its distinguished appearance, has been introduced into various English and French parks, and in the Zoological Gardens it has bred repeatedly. In its native land this Deer breeds in October, but when transferred to Western countries, the fawn makes its appearance in June, a wise provision of Nature that does not subject the very young animal to our severest weather.

THE SAMBAR (*Cervus unicolor*)

The Indian Sambar is a large and powerful animal exceeding the Red Deer in dimensions, yet equalling it in activity and energy. In colour it is a sooty brown with a patch of tan over the eyes; the antlers are three-tined, a snag projecting forwards just over the crown and the tip simply forked, but they may attain a length of forty-eight inches over the outer curve. Sometimes the antlers are retained for a couple of years. It is a woodland Deer, is common only in very wild tracts, and grazes chiefly at night. The herds usually contain from four to a dozen animals, except in the breeding season, when the Sambar assemble in large numbers; but ordinarily it is quite frequently to be met with singly. It is a water-loving animal, and is much addicted to mud baths.

Rarely showing itself in the open, the Sambar is hunted with dogs, and as it is very tenacious of life, even a wounded animal will often make desperate efforts to escape its pursuers, although its pace is only moderate. Sir Samuel Baker says that "nothing can be conceived more terribly grand than the rush of so large an animal through the air. . . . Out crashed the buck at a pace which soon left the three greyhounds behind." Two of them lost sight of the quarry in the undulations, but the third, powerful of loin and thigh, "sped up the steep mountain side, and was soon after seen within fifty yards of the buck, all alone, but going like a rocket. That pace could not last uphill, and round the stag doubled, and came flying down the mountain side. An abrupt precipice of about 250 feet was lying exactly in his path. Down they flew with unabated

speed ; the bitch was at his flanks and sprang at his ear. Fortunately, she lost her hold as the ear split. This check saved her ; and the next instant he was flying through the air to headlong



SAMBAR

destruction—crash ! It was all over. The bitch had pulled up on the brink of the precipice, but it was a narrow escape.”

There are other species of Sambar found in the Malay Peninsula, Java, and the Philippine Islands, all smaller animals ; but in form and habits much resembling the head of the group.

THE FALLOW DEER (*Cervus dama*)

The Fallow Deer is a pleasing addition to many of our parks, where considerable herds may be seen reposing under the trees, or chasing one another in graceful play. It is said to have been introduced from Norway by James I, but this Deer certainly existed in Windsor Park long before the time of James, and there is some reason for believing that the Romans really introduced the animal into Britain from the South of Europe or Western Asia.

It is from this semi-domestic Deer that our best venison is obtained, for it is less hard and dry than that of the Stag.

A full-grown Fallow Buck stands three feet in height at the withers, and in exceptional cases will exceed 200 lbs. in weight, though 150 lbs. is a good weight for an average animal. In summer its coat is generally fawn or reddish brown, spotted with white, and with several white lines upon the body ; in winter the colouring is greyer, with the spots exceedingly faint ; but there is a variety that even in summer is blackish brown with only a faint semblance of spots. The antlers differ from those of any Deer yet described in the flattening or palmation of the upper portions. Good antlers range from eighteen to twenty-eight inches in length, and no case appears to be on record where they were thirty inches. In its second year the young buck with its simple snags is called a 'Pricket,' and in the succeeding season, when each beam puts out a front branch, it becomes a 'Sorrel.' A year later the spreading crest shows more than mere signs of palmation, increasing in following seasons until in its sixth year the buck attains maturity. In some parts of Scotland, where the Fallow Deer have enjoyed their freedom over wide tracts, they have become as wild as the Red Stag, and even within the confines of a park the animals exhibit much wariness and cunning when once they have been shot at.

The Mesopotamian Fallow Deer (*C. mesopotamicus*) is a larger animal ; its coat is brighter and is always spotted, and its antlers are more spreading, though less palmated.

Naturalists incline to the opinion that the Irish Elk of prehistoric times, whose remains are frequently unearthed, was but a species of Fallow Deer. Its antlers were six feet in length, heavily palmated, and with a spread of more than nine feet from tip to tip. Such a trophy makes a modern Nimrod jealous of the sport that was within the reach of his ancient Irish prototype.

THE MUNTJAC (*Cervulus muntjac*)

The Indian Muntjac, Kakar, or Barking Deer, is only two feet in height, and scales less than thirty pounds. It is slender and agile and beautifully clothed in golden, reddish-shining fawn. The antlers are small and simple, only a brow tine issuing from the beam, which is generally four or five inches in length, but in rare cases twice as long. The face of the animal has two ridges running obliquely below the eyes, gaining for it still another name, the Rib-faced Deer. It is a shy and stealthy little creature, and is capable of great speed, even through dense jungle, running with its head well down and its haunches raised. When hunted, it has to be driven out of cover, but the buck is furnished with long canine tusks in the upper jaw, and it does not hesitate to use them with telling effect upon dogs. Even when being driven to the guns the

Jungle Sheep, as it is sometimes called, will break back, and give the sportsmen so little chance of anything like a sure aim, that shot are generally employed instead of a bullet. When it is alarmed it gives a cry very like the bark of a fox, as it darts for what is often impenetrable cover.

There are several species of Muntjac in China, Tibet, and Tenasserim, all loving dense cover, and of similar habits to their Indian relative. The animal depicted in the photograph is an albino, and in its unfamiliar coat is a particularly striking little deer.



ALBINO MUNTJAC

THE ROE DEER (*Capreolus caprea*)

The European Roe Deer is a small species, only about two feet four inches in height at the shoulder, and less than half the weight of the Fallow Deer. The antlers are from nine to thirteen inches in length, their points, usually three in number, taking three years to grow. The hair is coarse and stiff, dark reddish brown in colour with a white patch around the tail. It is sometimes asserted that even when wounded and brought to bay the Roebuck will not turn upon its pursuer; but Mr. Millais says that it will defend itself vigorously against a dog with head and fore-legs, and another authority declares that the doe will use her hind feet as well, and will give her opponent a much more forcible shock than her mate. So-called tame animals are not to be trusted after their third year, for they will often single out women and children for attack; and in one instance a boy of twelve years was killed, there being no less than fifty stabs of the sharply pointed horns in the body of the unfortunate victim.

There are many herds of semi-domesticated animals in parks up and down the country, but our native wild animal now exists chiefly in the Highlands of Scotland, and Dorset. In Germany and Austria-Hungary the Roe Deer is exceedingly plentiful, and

within the last twenty years over 68,000 head have fallen to the hunters in a single season.

The Siberian Roebuck is bigger, more thickly coated, and possesses larger antlers. With the approach of winter, herds of as many as two hundred and fifty collect and migrate into Manchuria ; and on their return in the spring hunters secure them in thousands, especially as they cross rivers on their way to their summer quarters.

THE REINDEER (*Rangifer tarandus*)

The Reindeer is a native of the Arctic regions of Europe, Asia, and America, although in the New World it is called the Caribou, which some naturalists prefer to consider a distinct species. Though the animals differ in size in various regions they are all heavily built Deer, with short necks and stout limbs, which terminate in large, widely cleft hoofs, and as the lateral hoofs are large, and also come



REINDEER

in contact with the ground, a more than usually large surface supports the weight of the animal, which is of marked service when it is traversing snow. The American animal is the largest, a good buck standing about four and a half feet in height at the withers, and weighing about four hundred pounds. In summer the coat is generally dark brown in colour, with white on the neck, nose, abdomen, and hind-quarters ; in winter the rather wavy hair lightens into greyish. The under-fur makes a Reindeer skin almost

as serviceable as a blanket in a region where warm coverings are essential to life. In one feature the Reindeer is unlike any other of the Cervidæ: both sexes have antlers. Those of the male are often five feet in length, and are particularly noticeable for the manner in which the brow tines are palmated. The antlers of the female are smaller, lighter, and exhibit less palmation; but in both sexes the antlers of any animal rarely match each other. The Reindeer in the photograph is an immature specimen.

It is doubtful if there are now any wild Reindeer in Scandinavia, and even domesticated animals do not extend below the southern shore of the Baltic, although Reindeer remains are found in England, and in France as far south as the Garonne, which proves that the animal's range in olden times was much more extensive than at the present day. Domesticated animals are common in the North of Norway, Lapland, and Siberia; it thrives in Iceland, and has been introduced into America, notably Labrador and Alaska; but all attempts to naturalise it in the north of Scotland have ended in complete failure.

No domesticated animal in any part of the world renders better service to its owner than does the Reindeer. The Laplanders count their wealth in the animal. Those who possess a herd of a thousand or more are reckoned among the richest of their country, and the poorer members of the community merge their little herds with those of their employers, as the animal is gregarious, and even in captivity thrives better in large companies.

The Reindeer is extensively employed in drawing sledges, and with a load of two hundred and fifty pounds it can travel at nine or ten miles an hour, and keep up that rate of progress for twelve hours or more; but carrying only a single passenger a fine animal has been known to travel eight hundred miles in a couple of days.

In a wild state the Reindeer is a migratory animal, making annual journeys from the woods to the hills, and back again, according to the season. The object in leaving the forests in the brief summer months is chiefly to escape the attacks of mosquitoes. Even in a domesticated state the Reindeer is obliged to continue its migrations, so that the owners of the tame herds are forced to become partakers in the annual pilgrimages. In winter, when the land is covered with snow, with its palmated, shovel-like brow tines, hoofs, and snout, the Reindeer lays bare the lichens upon which it feeds; but sometimes the snow is frozen so hard that it can make no impression, and many of the unfortunate wild creatures die of starvation.

While alive, the Reindeer supplies milk, and when dead its flesh is excellent meat. The skin is converted into soft and pliable leather, and a number of skins sewed together make a warm tent. The undressed hide, cut into thongs, takes the place of rope and twine, and is utilised in the manufacture of fishing-lines, nets,

bow-strings, etc. Before metals were obtainable from civilised regions, the antlers were worked up into spear-heads and fish-hooks; and the shin bones were split and the edges sharpened to form very useful knives. The Indians of North America always found the Caribou of similar inestimable service, except that they never made any attempt to domesticate the animal. It is a strange fact that of all the numerous species of the Cervine family, the Reindeer is the only one that has been trained in the service of man, and that, too, by a race very low in the scale of civilisation.

THE ELK OR MOOSE (*Alces machlis*)

The Elk, the largest of the Deer tribe, is a native of Northern Europe and Asia, and the same animal, under the name of Moose, ranges North America, chiefly in Labrador, between the Mackenzie River and the St. Lawrence, and in Alaska. Only a few animals now remain in Scandinavia and Russia, and they are strictly preserved; in Siberia it is still fairly plentiful, but not nearly so much as in America. The largest variety is the animal of Alaska, which stands seven feet in height, and weighs 1400 lbs. The antlers do not attain their full length of from three to five feet until the fifth year, after which they increase in palmation at their extremities, until one wonders that the beast can carry so weighty a headgear, which may measure six feet across from tip to tip.

The coat of stiff, brittle hair is generally dark reddish brown or yellowish grey, and in winter there is a considerable amount of under-fur. There is a ruff of longer hair underneath the neck from which, in the males, is suspended a sac, known as the bell. The muzzle is large, and the upper lip is singularly developed and is very mobile, rendering useful service in browsing on leaves, that the animal prefers to grazing on grass, which the shortness of the neck renders very difficult on level ground. Though the Moose is awkward in build and clumsy in gait, its legs are long, and it can travel over hard ground at a good pace even when the route is encumbered with fallen trees. As it runs, the widely separated halves of the hoof clack together, and make a sound something like that of castanets. When the ground is covered with frozen snow, the weight of the giant Deer causes it to flounder, and hunters on snow-shoes have no difficulty in running down the labouring beast. In Scandinavia the Elk is hunted by driving, and the late King Edward VII took part in one great hunt, in the course of which nearly fifty Elk fell to the guns.

The Moose is rather a solitary animal. It is extremely wary, and the slightest sound or the faintest scent proves sufficient to send it off at a swinging trot. A native method of capturing the beast is to imitate the challenging roar of the bull, or the call of the cow, which will bring an animal crashing towards, instead of away from,

the hunter. Mr. Irland thus graphically describes how the ruse is worked :—

“Placing the birch-bark horn to his lips, the guide gave the long, wailing bellow of the cow Moose, not loud, but in the same coaxing tone which characterised the genuine article, as we had heard it vibrating in the evening air two or three days before. The echoes had not died away when, across the narrow water, from a thicket nearly opposite us, came the never-to-be-forgotten hoarse grunt of a bull, repeated every few seconds as the animal rushed towards the water’s edge. Then he broke through the bushes, as easy a shot as one could ask for. One glance was enough, the animal’s black bulk standing out against the rifle sight as big as the front door of a house. At the report of the heavy rifle, the Moose wheeled suddenly about, and plunged along the shore of the lake for fully fifty yards. While he was covering that distance I fired four times more, emptying the magazine of the rifle. Then the Moose rushed up the bank, and disappeared in the forest.” Hastening after him, the hunter pushed his way through the balsams and spruces, when he suddenly came upon the Moose, standing rigid among the bushes, within fifteen feet of him. The bristles stood a foot high on his shoulders, and his threatening antlers were not a pleasant sight to see ; but the rifle again spoke, and the poor brute crashed to the ground.

When wounded, the Moose is often a very dangerous antagonist, for it fights desperately with antlers and hoofs, and with a blow from either it will lay a wolf low. If captured young, the animal is rather easily domesticated, and from its great size and power it can be used as a beast of carriage or burden. Its skin is extremely thick, and is said to make clothing that will resist an ordinary pistol ball. Its flesh is of good quality, either fresh, smoked, or dried ; but the muffle, or extended upper lip, is the tit-bit of the whole animal, and is considered to be equal to the celebrated green fat of the turtle.

THE MUSK DEER (*Moschus moschiferous*)

The Musk Deer is a native of the Himalaya and neighbouring regions. It is only two feet in height ; clothed with long, coarse hair, dark brown in colour ; and differs from other members of the Cervidæ in neither sex possessing antlers. In the male, however, the canine teeth hang down below the jaw. The feet are also very distinctive, the hoofs being widely cleft, while the false hoofs are exceedingly claw-like ; it is thanks to this provision that the animal is extremely sure-footed, making it an easy matter for it to ascend or descend the most precipitous places. The animal gains its name from an abdominal pouch in which the male secretes a powerfully smelling substance, known as musk, and being a valuable com-

modity, this Deer is persistently hunted, especially in the season when it migrates to



MUSK DEER

more temperate regions. The paths which are traversed by the Deer, in order to gain tracts where food is obtainable, are beset with traps. One method is to erect long fences in which are left numerous openings. The Musk Deer will pass through these gaps rather than leap over the fence; and in each gap is a noose that seldom fails to entangle a victim's feet. When the 'musk-pod,' as it is called, is removed, the hunters have to protect their nostrils, or otherwise the powerful odour would certainly cause severe

headache, and in all probability bleeding of the nose.

GROUP II—TRAGULINA

FAMILY: TRAGULIDÆ

The Chevrotains, Deerlets, or Mouse Deer, possess certain characteristics sufficient to call for their separation from the true Ruminants. In general form and habits they are quite deer-like, but they have no antlers, and the canine teeth of the upper jaw are developed into little tusks. The feet, with four digits, suggest relationship to the swine, and the stomach has but three compartments. Of at least half a dozen species, five are Asiatic animals, the remaining one being the Water Chevrotain of West Africa; but a description of any one of them will well serve for all.

INDIAN CHEVROTAIN (*Tragulus meminna*)

The Indian Chevrotain, or Kanchil, is the only member of the family that is spotted with white, the spots running more or less into longitudinal stripes, the background being variable shades of brown. With a body only about as big as a hare or rabbit, the Kanchil is timid, and at the same time as artful as it is small. Like not a few other animals, it is in the habit of feigning death when captured in a trap. It will lie without the movement of a muscle until the hunter releases the detaining cord, when it will leap to its feet and dart into the grass and jungle. The Malayan Chevrotain (*T. javanicus*) is a slightly smaller animal, and runs the royal antelope very closely in its claim to be the smallest of the Ungulates.



INDIAN CHEVROTAIN

GROUP III—TYLOPADA

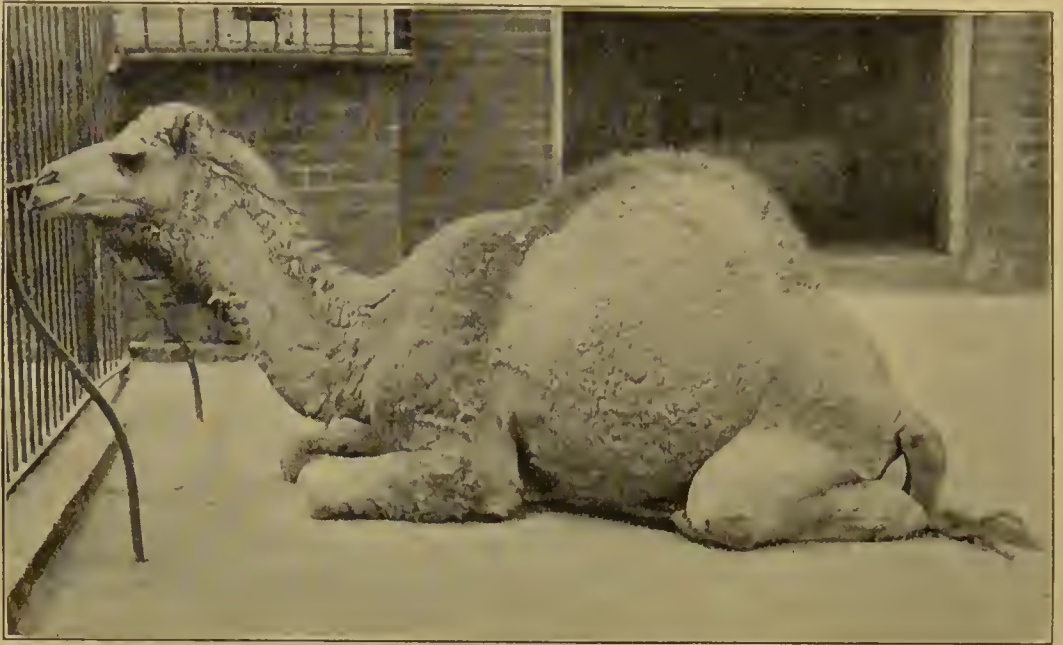
FAMILY : CAMELIDÆ

THE CAMELS

The true Arabian Camel (*Camelus dromedarius*) is the one-humped species, whereas the Bactrian Camel has two of these curious appendages ; but otherwise in general form, habits, and usefulness, most remarks concerning them are practically applicable to both. From the earliest times this ungainly-looking animal has been subjected to man, and in Eastern countries has always contributed much to the comfort, wealth, and influence of its owner.

The Arabian Camel is about seven feet high at the shoulder or nine feet to the top of its head, which is set on a long, curved neck. The colour of the rather long hair is generally a light brown, but sometimes it is nearly black, and in other cases almost white. The animal is intended to traverse parched and sandy plains, and its feet, fitted with soft, wide cushions, are well adapted for walking upon loose, dry sand. The knees and breast are furnished with

thick, callous pads, so that when it kneels to be loaded or relieved of its burden, there is little fear of injury to the skin. The stomach of the Camel has only three compartments, two of which are fitted with honeycomb cells, which permit the storing up of a considerable amount of water. Five or six quarts of water enable the animal



YOUNG DROMEDARY

to exist without further drinking for as many days, even though for that period it be traversing a furnace-like desert. The only vegetation of the arid regions of the East is hard, thorny plants, and upon these the animal browses without discomfort.

The 'hump' of the Camel is a very curious part of its structure, and beasts are judged by its size, shape, and firmness. The animal can really feed upon its hump, for in proportion as it suffers from privation and fatigue, so does the hump diminish; and at the end of a long and painful journey it will often have nearly vanished, only to be restored by a long course of good feeding. This peculiarity is somewhat paralleled by various hibernating animals that store up fat upon which to exist during a long period of fasting.

The deserts are frequently the scenes of terrible sandstorms, but the Camel's eyes are heavily lidded, and the large nostrils can be closed at will. Thus completely equipped for its strange life, the Camel faces the desert sands with boldness, and traverses the hot, arid wastes with an easy celerity that has gained for it the title of 'Ship of the Desert.'

In its native land the Camel is almost invariably employed as a pack animal, and it can support a load of five or six hundred pounds

with considerable ease. The term 'dromedary' is applied only to the lighter breed of animals, which are used for despatch purposes. Even the speed of the 'heirie,' as it is called, is only from eight to ten miles an hour ; but it can keep it up for twenty hours without stopping, or it will maintain a rate of seventy or eighty miles a day for nearly a week. To the uninitiated, camel-riding is neither easy nor comfortable. The rider mounts while the animal is kneeling, and sits like a lady with the right leg round the pommel of the saddle. In rising, the Camel suddenly straightens its hind legs so that, if the rider is unprepared, he is jerked over its ears. It moves with a long, undulating motion, swaying to and fro from its loins, in addition to which, it has an annoying habit of swerving from the track to snatch at any drab-coloured plant which it may happen to pass. The motion, however, is soon learnt, and, when fatigued, the rider can change sides, or shift his position in various ways. To ride a fast heirie, however, one needs to be swathed in tight bandages, for the rapid and continual jolting seems to dislocate every bone, and shake the digestive organs out of their places.

Useful though the beast is, it is ill-conditioned, morose, and rancorous in disposition, always ready to bite ; and as soon as it is unloaded, it promptly engages in vicious combats with its own species. Independently of its services as a beast of burden, the Camel supplies its owner with food and clothing. Its milk, mixed with meal, is a favourite dish, especially when it is sour. A rancid butter is also churned from the cream by a very primitive process, consisting of pouring the cream into a goatskin sack and shaking it constantly until the butter is formed. The long hair of the animal, which it sheds at certain periods of the year, is spun into coarse thread for the manufacture of cloth.

The Bactrian Camel (*C. bactrianus*), a native of Central Asia, is readily distinguished from the Arabian species by its double hump ; it is also taller and heavier in build, its legs are shorter and its hair longer. It is not so enduring as the Arabian animal, requiring a fresh supply of liquid about every three days ; but, nevertheless, it is invaluable to the nomads of many terribly arid tracts, and is of particular service in carrying merchandise from China and Tibet to many distant regions. The Persians have long employed this Camel, as well as the one-humped species, in a military capacity, mounting upon the saddle one or two swivel guns, which are worked by the rider ; in the Indian army the Camel corps renders excellent transport services.

The Camel has been introduced into various parts of the world ; in the south of Europe the animal rapidly deteriorates ; but in the desert regions of Australia it seems thoroughly at home, and, indeed, but for the Camel, the exploration of the interior of the island continent would scarcely have been possible.

THE LLAMAS

Although belonging to the same group, the Llamas cannot be confused with the camels. They are much smaller, possess no hump, the hair is very woolly, and altogether the general aspect is that of a long-legged, long-necked sheep. There is a marked deviation in the feet from the true camel type: the pads are less developed, and form two sharp and hard little hoofs that give



LLAMA

the animal a good grip on rocky ground. There are four species of Llama, which are restricted to the Andes regions of South America.

The true Llama (*Llama glama*) stands from three to four feet in height; the colour of its coat is generally brown or black, but sometimes it is marked with white. It is wholly a domesticated animal, and is well called the South American Camel. It is able to carry a load of about a hundredweight at a pace of ten or twelve miles a day, and enduring for four or five days without water. The Spaniards made much use of the animal in their early occupation of South America, and from the Potosi silver mines alone, 300,000 Llamas were employed in conveying the precious metal to the coast. The animal is very camel-like in disposition. If

dissatisfied with the weight of its load, it will lie down and refuse to budge an inch until the burden is lightened, and even when on its best behaviour it will only go at its own pace. If a rider retain his seat longer than the awkward steed desires, it will indicate its displeasure by turning its head, and discharging a mouthful of offensive saliva into the rider's face. Visitors to zoological collections are often similarly treated by captive animals.

The Alpaca (*L. pacos*) is a smaller, semi-domesticated animal, reared on the high tablelands for the sake of its wool, which is yellowish brown or black, grey or white. Alpaca wool was formerly only used for making coarse sacking, until the invention of special machinery that could deal with the peculiar fibre of the wool, giving rise to quite a new industry, which now has its seat at Saltaire, in Yorkshire. Various attempts to transfer the Alpaca to England and different parts of Europe have never proved successful. Australia was judged to be a favourite location, and three hundred animals were imported ; but in a few years they had sadly decreased, and the experiment is not likely to be repeated.

The Guanaco (*L. guanacus*), the ancestor of the two foregoing animals, is found in herds throughout the Andes region from the Equator to Cape Horn. It is a wild and wary creature, clothed with short, rough brown hair, and hunted chiefly for the sake of its flesh.

The Vicuna (*L. vicunia*), the smallest of the Llamas, is another wild and untameable animal, chiefly inhabiting Peru and neighbouring regions ; and in its habits so much resembles the chamois that it is seldom captured alive. The brown coat of this animal is short, but it is soft and silky, and consequently in great request, and its flesh is the best of the whole family. To capture the Vicuna the natives use the *bolas*, two wooden or metal balls connected by a leathern thong, which, being whirled round the hunter's head and then skilfully released, seldom fails to entangle the fugitive's feet, and bring it to the ground. At one time a law was passed to compel hunters to set the captive free after it had been sheared ; but owing to the difficulty of taking it alive the enactment became inoperative.

GROUP IV—SUINA

FAMILY : SUIDÆ

The animals composing the Hog tribe are found in every part of the globe. They have a long, projecting snout with the nostrils at the end, which, though capable of some mobility, cannot be coiled round anything to lift it from the ground ; its chief use is for turning up the soil in search of roots, although all the Swine will eat flesh, if the opportunity present itself. In form they are heavy and massive, the body nearly naked, or at best only sparingly

haired, and the ears are large and flapping. The upper canine teeth, especially in the male, are generally long and flattened, slightly curved upwards, and thus forming terrible weapons of offence. The feet are narrow and cloven, dividing the hoof, though its owner does not chew the cud.

THE TRUE PIGS

The Domesticated Swine (*Sus scrofa*) in its general build, and its rooting and wallowing habits, is typical of the whole family. Its flesh and fat are especially valuable an account of their adaptability for preserving with salt, without being rendered hard and indigestible. Its hide makes leather that is excellent for saddles, and its bristles are extensively used in the manufacture of brushes. As with all the domesticated animals that are used for food, the different breeds, which are extremely variable in appearance, count their good points either in size or the quality of the meat. In its wild and domesticated state the Hog, considering its size, is a most prolific animal, producing from eight to twelve young pigs twice a year. It is on record that a sow, when she died, was the parent of no less than three hundred pigs.



EUROPEAN WILD PIG

The European Wild Pig was once found in Britain, but it is now restricted to the great forests of Central Europe. The semi-wild forest Pigs of Hampshire show distinct traces of their wild ancestors.

They have high crests, broad shoulders, and thick, bristly manes ; they are very active, and much fiercer than the ordinary pen-bred animals. Hunted either on foot or horseback with hounds, the Wild Boar is a terrible antagonist, making his charge with lightning swiftness, sufficient to disconcert anybody not possessed of nerves of steel, and a steady hand. The brute has an awkward habit of suddenly swerving from his course, snapping at a hunter's spear-head, and breaking it from its shaft. When the sportsman is mounted, the Boar will charge at the steed and, rearing on his hind legs, will lay open the horse's flank and disable it instantly. Several ineffectual attempts have been made to reintroduce the Wild Pig into British forests for sporting purposes.

The Indian Wild Pig (*S. cristatus*) is of greater size, strength, and swiftness. It is a sore plague to agriculturists, making terrible havoc among the crops, and is especially fond of sugar cane. The boar will fight anything that comes in his way, and even the tiger sometimes succumbs to the long tusks that cut like knives ; the sow cannot rip up an opponent like her mate, but she can bite sharply and rapidly. Probably more hunters are wounded in pig-sticking than in tiger-hunting. Quick and intrepid in attack, one of these porcine warriors will charge its foes even when the spears, implanted in it, stand out in all directions, in which case they become weapons of offence against the spearmen who hurled them. The Boar's tusk thrust is given with a wriggling movement of the head, inflicting a cut to the right, and another to the left.

There are several other kinds of Wild Pig in India, Malaysia, various East Indian islands, and Africa. The tiny Pigmy Hog (*S. salvanius*) of the Himalayan forests of Bhutan and adjoining states is not much larger than a hare. Of the Bush Pigs of Africa—Bosch-Varks the Boers call them—the Red Bush Pig (*S. porcus*) is the most noticeable in appearance. In colour it is chiefly a brownish red washed with yellow, the limbs are black, and there is white on the cheeks, the edges of the ears, and round the eyes. This rather brilliant coloration renders the animal easily the handsomest of a tribe that makes no pretensions to beauty.

THE WART HOG (*Phacochoerus æthiopicus*)

There are several varieties of Wart Hog found in East Africa from Cape Colony to Abyssinia ; and of various unprepossessing animals, this Ethiopian beast is second to none among the Ungulates for absolute ugliness. Its main features are the disproportioned head, large, fleshy protuberances on the face, and tusks that sometimes measure over two feet in length. One stroke of these weapons will cut a dog in two, or sever the fleshy part of a man's thigh. The general colour is dull brown, merging into black ;

the fore-quarters are covered with long, bristly hair, the remainder of the body often being nearly naked.



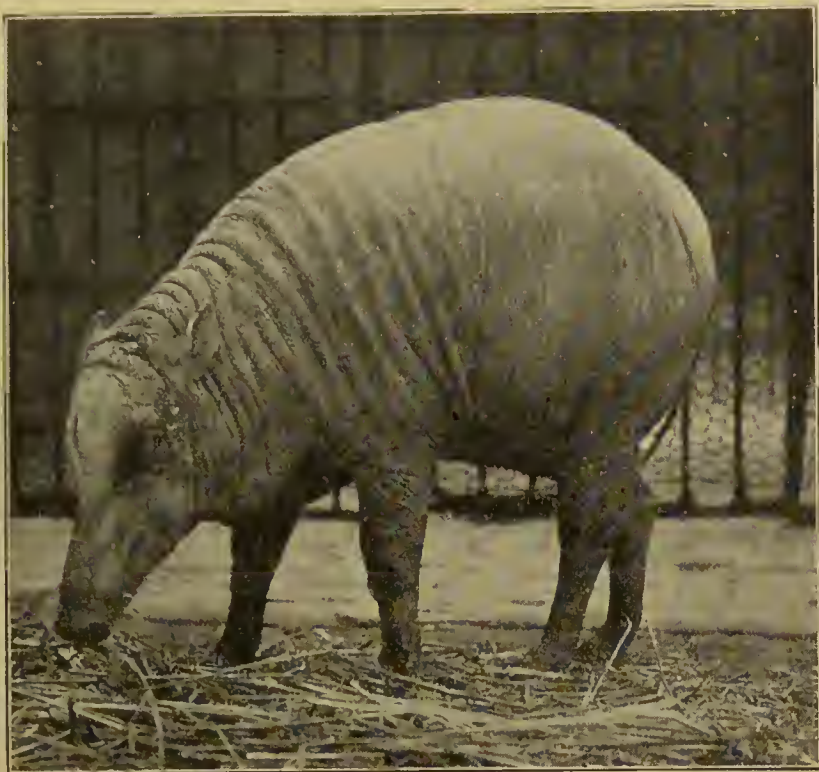
WART HOG

The Vlacke-Vark (Black Hog), as it is called in South-west Africa, is a savage and determined opponent, and its charge is greatly to be dreaded. When chased, it presents a most absurd appearance. On account of its short neck, and the excrescences on the side of the face, the animal is unable to look round to see whether it is gaining on its pursuers. It is, therefore, obliged to lift its snout perpendicularly in the air, so as to look over its shoulder; and as it always carries its tail stiff and upright when running, it has a most ludicrous aspect. But the Wart Hog is not nearly so fierce in combat as the Indian Wild Pig, and almost invariably makes for the holes of the aard-vark, into which it charges stern foremost.

THE BABIRUSA (*Babirusa alfurus*)

The Babirusa of the Malayan Archipelago is a dull, ashy grey animal, sparsely clothed with bristles. Its tusks, generally four in number, are arranged in a very curious manner. They curve upwards through holes in the upper lip, and the points of the foremost pair nearly touch the skin of the forehead, so that they are quite useless as offensive weapons; but the shorter ones are capable of inflicting terrible wounds. The female is devoid of these strange dental appendages.

The Babirusa lives in herds of considerable size, which work no little damage in the maize plantations. The natives systematically



BABIRUSA

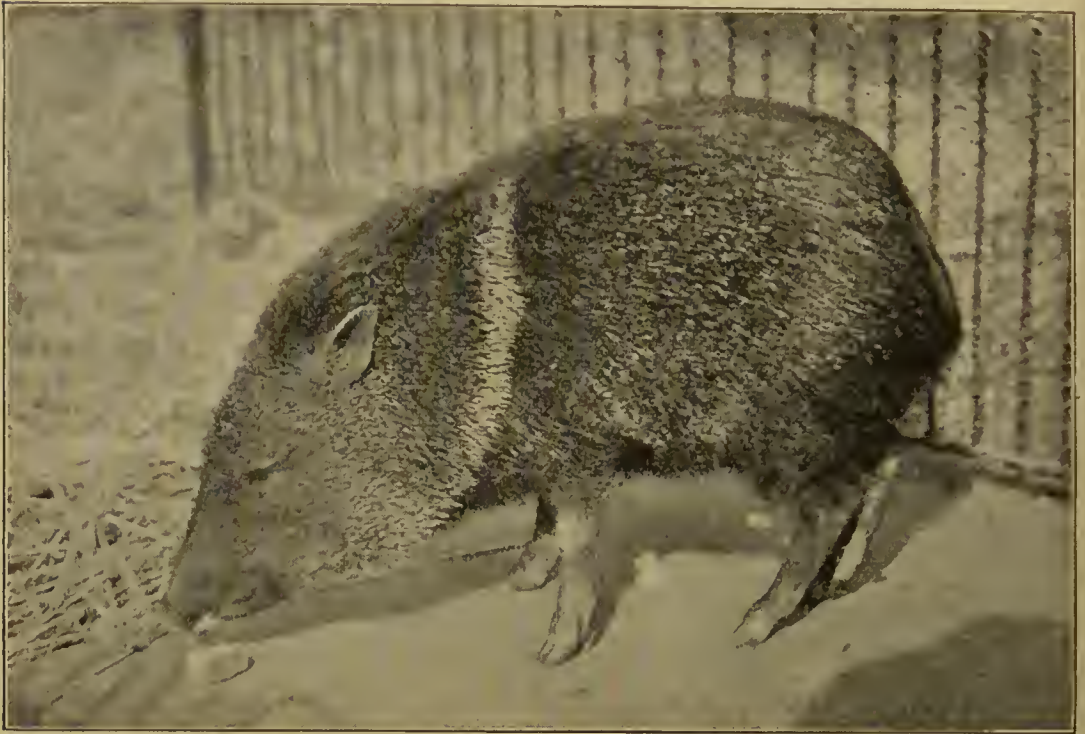
hunt the animals to lessen their depredations, and to utilise their flesh for food. The chief method of capture is by driving a herd into a corral flanked by netting, in the meshes of which feet and tusks get entangled. When alarmed, the animal seeks water, if there be any near. It is an excellent swimmer, and often quite voluntarily crosses the narrow sea channels between the various islands.

FAMILY : DICOTYLIDÆ

THE PECCARIES

The Peccaries, the American representatives of the Swine, differ from their Old World cousins in several important particulars ; their hind feet have three toes instead of four ; their stomachs are more complex and approach the ruminant type ; and their tusks point downwards instead of upwards. What distinguishes them even more particularly from other pig-like animals is the possession of an open gland immediately under the skin in the middle of the back, from which issues an oily substance, disgusting in odour. When an animal is killed, the gland must be removed immediately or the flesh will become tainted and uneatable.

The Collared Peccary (*Dicotyles tajacu*) inhabits various regions between Arkansas and Texas in the north and Patagonia in the south. It stands not more than sixteen inches high at the shoulder, and its bristly hairs are blackish brown, mingled with yellowish



COLLARED PECCARY

brown and white on the flanks. The animal gains its name from the rather broad, yellowish collar or stripe that is drawn round its neck.

The White-lipped Peccary (*D. labiatus*) is not only a slightly larger animal, but is infinitely more fierce, and its little lancet-shaped tusks are as much to be feared as the bigger weapons of the wart hog. The range of this species is not so wide, extending from British Honduras to Paraguay. The Peccary knows no fear, and seems unable to apprehend danger. A herd wages a joint fight against any human or animal enemy; hunters are often forced to seek safety in the branches of a tree, and though the jaguar and puma capture all stragglers, they, too, flee from the united attack of an angry herd, with their flashing eyes and gnashing teeth.

The food of the Collared Peccary is very varied, consisting of fruits, grain, roots, reptiles, small birds and their eggs and, in fact, almost anything vegetable or animal which can be swallowed. The White-lipped species restricts itself more to a vegetable diet, and is a particular nuisance to the agriculturist.

FAMILY : HIPPOPOTAMIDÆ

THE HIPPOPOTAMUS

The Hippopotamus, or River Horse, the next bulkiest quadruped to the elephant, frequents the rivers and lakes of different African regions between Khartoum and the upper course of the Limpopo. Owing to its short legs, it is not more than from four to five feet in height at the shoulder, but its length varies from twelve to fourteen feet, and a full-grown animal, with its swollen, barrel-like body, may weigh four tons. The rough, tough, and warty hide



YOUNG HIPPOPOTAMUS

of the male is a slaty copper-brown in colour, the female being of a lighter shade ; it is bare except for a few strong bristles on the face, muzzle, neck, and tail. The hide, when freshly removed, may weigh five hundredweights, and being one and a half inches thick on the back is not easily taken from the creature's body except in strips like so many planks.

The enormous head of the Hippopotamus is remarkable in shape, the small, erect ears, bulging eyes and nostrils being set in a line. This construction enables the animal to raise its eyes and nostrils above the water to survey the prospect and breathe, without exposing more than a few inches of its huge bulk. Within the mouth is a rather terrifying armoury of gleaming white teeth ; the canines curve backwards, and are sometimes nearly forty inches in length, although the average is about thirty ; and the lower

incisors lie almost horizontally with their points projected forwards. This formation of the teeth enables the animal to cut grass and reeds as though with shears, or tear up the aquatic plants which form a great part of its food. Only when wounded or irritated does the Hippopotamus use its teeth as offensive weapons. It can crack the sides of a native canoe as though it were cardboard ; and has been known to sever a man in half with a single snap. At one time the tusks were in great request by dentists for the manufacture of artificial teeth. In those days hunting the Hippopotamus was often a highly profitable undertaking, for a large tooth weighs from five to eight pounds, and the ivory was worth as much as twenty-five shillings a pound. The huge beast is not particularly difficult to kill with modern sporting rifles ; Mr. Neumann once secured four full-grown animals with four consecutive shots, and another hunter killed nine with ten shots.

The Hippopotamus is a gregarious animal, collecting in herds of twenty or thirty. In some regions hundreds of beasts may be seen in a stretch of but a few miles of river ; but at any time a herd is difficult to count, as the animals are continually diving and rising, and never appear simultaneously above the surface of the water. Though the Hippopotamus prefers fresh water, it is not at all averse to salt, and will sometimes travel by sea from one river mouth to another. It is an admirable diver, and, as it can close its ears and nostrils at will, it can remain below the surface for five minutes. During the first few months of its existence the baby Hippopotamus is carried on the neck of its dam when in the water, and for its sake alone she has to come to the surface oftener than she need do on her own account.

Possessed of an enormous appetite, with a stomach capable of containing five or six bushels of nutriment, the Hippopotamus is an unwelcome visitor to cultivated tracts. The mischief is not confined to the amount of vegetable food necessary to satisfy the appetite of the voracious brute ; it damages far more than it eats. When a number of these hungry, awkward, splay-footed beasts come blundering among the standing crops, trampling and devouring indiscriminately, the result is heart-breaking to the cultivator. The natives endeavour to protect their grounds from depredation. Across the Hippopotamus paths are dug pitfalls with a sharp stake in the centre of each. When a huge animal falls and is impaled, it cannot extricate itself, and great is the rejoicing of its captor. Hippopotamus ivory still has a distinct commercial value ; the hide is useful for manufacturing whips and other articles, and the dark, red flesh, which is very good eating, is often salted by the Boers, who thus make a coarse kind of bacon of it.

Although so huge a creature, the Hippopotamus is generally harmless ; but if molested in its watery home, it will sometimes make a violent attack upon the object that has excited its anger.



PLATE XIII

Hippopotamus
Bactrian Camel

An animal, whose calf had been speared the previous day, made at the boat in which Dr. Livingstone was sitting, and drove her head against it with such force that she lifted the forepart of the boat completely out of the water, and forced the whole crew to jump ashore. Another enraged animal tried conclusions with a passing river steamer, with the result that the paddle-wheels were bent, and several holes torn in its keel.

The Hippopotamus thrives and even breeds in captivity. The London Zoological Society secured its first specimen in 1850; it was a male from the River Nile, and a consort arrived three or four years later. The first two calves only survived a short time, but a third one, born in 1872, lived until 1908, when it died from old age.

ORDER: SIRENIA

The two singular animals that form this order caused naturalists much difficulty in deciding upon their proper position in the animal kingdom. At one time they were placed next to the elephant and at another were classed with the whales. They are fish-like mammals that feed strictly upon vegetable substances. Their nostrils are placed at the extremity of the muzzle, as is the case with most mammals, and they are never employed as blow-holes after the manner of the cetaceans.

THE MANATEE (*Manatus australis*)

The Manatee is found in the shallow seas and estuaries of the Gulf of Mexico and the east of South America. It is commonly about eight feet in length; its thick, tough hide is dark brown in colour, and its muzzle is terminated by a fleshy disc in which the nostrils are situated. The front limbs are fins with a considerable amount of prehensile power, and the rounded tail is placed vertically. It feeds upon the algæ and herbage that grows abundantly at the edges of tidal estuaries.

The Manatee does not leave the water in search of food as was once supposed, but, when feeding, it often lifts part of its body ashore. It has also the strange habit of elevating its head and shoulders above the surface of the water, in such a manner that it bears some resemblance to a human being. Another species (*M. senegalensis*) inhabits the waters of the West Coast of Africa. There are differences of opinion concerning Manatee flesh. The natives of the regions where the creature abounds look upon it with special favour; they salt it and preserve it by drying in the sun; but Europeans consider that it tastes like coarse pork with a fishy flavour, which does not sound particularly inviting.

THE DUGONG (*Halicore dugong*)

The Dugong frequents the coastal waters of the Red Sea and the Indian Ocean, and on the north of Australia. It much resembles the manatee in shape, but it is a little longer, and its tail is forked. Whole herds of these animals may be seen sporting near the shores, diving at intervals to procure food, and rising again in order to breathe. They are most affectionate creatures, and if one of a pair be captured, the other falls an easy prey to the pursuers, as it refuses to leave the fatal spot. When the female Dugong is nursing



Photo Prof. A. C. Haddon

DUGONG

her child, she carries it in one arm, and takes care to keep the head of her offspring, as well as her own, above the surface of the water. This habit, common to both the Dugong and the manatee, probably gave rise to fabulous tales of mermaids and sirens, and hence the name of the order. The Mahometans abhor the flesh of the swine, but they esteem that of the Dugong, notwithstanding its porky flavour, but the fisheries are chiefly concerned with the hides and oil.

The Rhytina, another of these fish-like herbivorous mammals, attained a length of twenty-five feet, and a girth in proportion. It was first discovered by some shipwrecked sailors, who were cast away on an island in Behring Strait. Sealers and sea otter hunters, in their greed for oil, exterminated the creature in the short space of thirty years.

ORDER : CETACEA

THE WHALES AND DOLPHINS

The Cetacea, including the largest of all mammals, are more thoroughly aquatic than the seals; their livelihood is obtained wholly in the waters, and their entire structure is only fitted for traversing the waves. Although the Whales closely resemble the fish, and are able to pass a considerable time below the water, they possess no gills, but breathe atmospheric air in the same manner as the other mammalia. When one of these gigantic creatures rises to the surface of the sea, it makes huge respirations, called 'spoutings,' in which a column of mixed vapour and water is ejected from the nostrils or 'blow-holes' to a height of as much as twenty feet. The animal can respire with the exposure of only the upper part of the head, where the blow-holes are placed, and a part of the back. It is plain that a supply of air cannot be taken down into the ocean depths, since any such enormous inflation would render the animal sufficiently buoyant to lift it out of the water. The difficulty is overcome by furnishing it with a large reservoir of arterial blood, which is oxygenised during the spoutings, and kept in reserve for use by the four-chambered heart. When the reservoir is deprived of its oxygen the animal must rise to the surface or it will inevitably drown.

Externally, the fore-limbs closely resemble the fins of fish, but when the skin is stripped off, it exposes typically mammalian digits. They are of little or no aid to progression, which is accomplished by means of a horizontal and enormously powerful tail; some species possess a dorsal fin. The fore-limbs are chiefly used to preserve the balance of the huge carcass, and the mother Whale uses them as arms to clasp her offspring. There is usually only one young Whale at a birth; it is born alive, and is suckled like other young mammals; and it is at once capable of accompanying its mother in her paths through the waves. The skin of the Whale is hairless, and underneath it is a large layer of fat, sometimes nearly two feet in thickness, elastic as indiarubber, and providing warmth and capital resistance to the enormous pressure of the water when the body is deeply submerged.

The Cetacea are divided into two sub-orders—the *Mystacoceti* and the *Odontoceti*. The first contains only the one family, *Balæntidæ*, in which the animals have no teeth, the mouth being fitted with plates of baleen, popularly, and incorrectly, called 'whalebone,' with which to strain the multitudinous small creatures upon which the Whale feeds. There are two external blow-holes or nostrils. The *Odontoceti* comprises the remaining cetaceans, furnished with teeth in one or both jaws, and only one external blow-hole.

FAMILY : BALÆNTIDÆ

THE GREENLAND WHALE (*Balæna mysticetus*)

The Greenland Whale, Northern Whale, or Right Whale, is an inhabitant of the Arctic Ocean. Its head is remarkably large ; the jaws opening very far back, the mouth is about sixteen feet in length, seven feet in width, and ten or twelve feet in height ; or affording space, as has quaintly been remarked, for a jolly boat and her crew to float in. The most curious feature of the mouth is the baleen, several hundreds of plates of which hang down from each side of the upper jaw. These strips vary in length according to position, but the largest are from ten to twelve feet long, nearly a foot wide at their base, and splitting at the extremity into a multitude of hair-like fringes. The total weight of the baleen in a large Whale is about a ton. When feeding, the animal drives along with open mouth, engulfing the countless millions of tiny beings that swarm in the waters—small shrimps, crabs, lobsters, molluscs, medusæ, etc. When the mouth is filled with a mass of living creatures, the tongue, two tons in weight, is raised, the water is strained out through the baleen fringes, leaving a mass of food to travel down the gullet, which is so small that the largest animal in the world cannot swallow a good-sized herring.

When full-grown, the Greenland Whale attains a length of seventy feet, but specimens exceeding fifty feet have become increasingly rare. Whale-hunting for oil alone is not nearly so profitable an occupation as formerly, for vegetable and mineral oils are more easily and regularly produced. Notwithstanding its enormous bulk this species of Whale is inoffensive and timorous, and except when roused by the pain of a wound, or by the sight of its offspring in danger, will always flee the presence of man. In the old days, when the Whale was harpooned by hand from a rowing-boat, it has been known to turn fiercely upon the boat from which the fatal weapon was launched, and with a single blow of its enormous tail to shatter a stout craft, driving men, ropes, and oars high into the air. The modern whaler is a steam screw vessel, and the harpoon is fired from a special gun. Some northern explorers assert that the Greenland Whale is as numerous as ever it was, continual hunting, and especially the revolving of the screw propellers, having caused it to retire to the more remote Arctic waters.

THE RORQUALS

Giants among giants, the Rorquals are called Fin Whales or Fin-backs because of the small back fin, which is placed about midway between the middle of the back and the flukes. They are the most widely distributed of the larger cetaceans, and are found in nearly all ocean waters outside the Antarctic regions. The various

species differ greatly in size ; the Lesser Fin Whale (*B. rostrata*) averaging from twenty-five to thirty feet in length, while Sibbald's Fin Whale (*B. Sibbaldii*) measures eighty-five feet or more. Both species are occasionally seen in British waters, and at intervals are caught or stranded on our coasts.

The Common Rorqual (*B. musculus*) is fairly abundant in the northern seas of Europe. It rarely exceeds seventy feet in length, although one caught in the North Sea was ninety-five feet long, and weighed two hundred and fifty tons. When Whale-hunting was at its height, the Rorqual was but little sought, for its blubber is thin, and the baleen strips are not only shorter, but are of poor quality. In any case its activity and fearlessness made hunters



COMMON RORQUAL

very chary of attacking it. Upon one occasion a harpooned Rorqual started off in a direct line, and at such a speed that the men lost their presence of mind, and forgot to cut the rope that connected the Whale with the boat. The Rorqual shot under a neighbouring ice field, and drew the boat with all its crew beneath the ice, where they disappeared for ever from the gaze of mankind. Not being hampered by a small gullet, the diet of the Rorqual is altogether different from that of the Greenland Whale. In its stomach six hundred large codfish have been found, together with a considerable number of pilchards. It often follows shoals of migrating fish until it approaches the shores of Great Britain, where it hovers around the fishing-grounds, swallowing whole boatloads of herrings and other fish. Eventually it is almost sure to fall a victim to its own temerity, and to be left by the returning tide, helplessly and igno-

miniously stranded on the shore. The accompanying photograph depicts a Rorqual stranded at Cloughton, near Scarborough, on March 27th, 1910. After a short time the local sanitary authorities removed the decaying monster, which weighed seventy tons.

The Southern Right Whale (*B. australis*), though smaller, is practically identical in form and habit with its northern cousin; but its home is chiefly in the waters adjacent to the Cape, Australia, and New Zealand, and in no case does it extend into the icy solitudes of the Antarctic. Southern whaling is now of little importance, though it is said that the silent seas are again inhabited by thousands of what was once an almost exterminated species.

The Hump-backed Whale (*Megaptera boops*) ranges nearly all ocean waters, but only occasionally is it taken on the British coasts. It grows to a length of fifty feet; it has flippers over a dozen feet long, and is chiefly remarkable for the longitudinal folds in the belly blubber. All Whales are tortured by barnacles, limpets, etc., that attach themselves to the islands of flesh. The folds in the Hump-back's skin afford cover for parasites, from which they cannot be removed, even when the sufferer drags its immense carcase over rocks and coral reefs in its vain endeavours to obtain relief.

FAMILY: CATADONTIDÆ

THE CACHALOT (*Catodon macrocephalus*)

The Cachalot, or Sperm Whale, inhabits the warmer parts of the oceans; and voyages from one part of the globe to another, as proved by Whales caught in the Atlantic Ocean, in whose flesh were embedded the spears of South Pacific islanders, who had made abortive attempts to catch them. The largest Sperm Whales are about sixty feet in length, with a circumference of nearly thirty feet; but when the species was more common doubtless many animals exceeded these dimensions.

The Cachalot's distinguishing feature is its enormous and curiously formed head, in the upper portion of which is a great cavity, containing a limpid liquid, a mixture of oil and spermaceti. This latter substance, when purified, hardens by exposure to the air; it is of use as a medicinal ointment, and for the manufacture of candles. The blubber is seldom more than a dozen inches in thickness, but the superior quality of the oil atones for deficiency in quantity. A Whale of sixty feet in length will generally yield about twenty-four barrels of spermaceti and a hundred barrels of oil. There is, however, a still more valuable substance, namely, ambergris, which is a fatty concretion of the gall ducts. It exists in small quantities in the intestines of the Whale, but it is usually found floating in the sea in ejected masses, sometimes a hundred pounds in weight. Refined ambergris is an expensive drug, worth £5 an ounce. It is

chiefly used in perfumery, especially as the basis of a costly frankincense.

The Sperm Whale has no baleen plates ; but its lower jaw is furnished with forty to fifty immense conical teeth, which fit into grooves in the untoothed upper jaw. These teeth are nine inches in length, and of such a girth that one will weigh three pounds. This Whale feeds upon squids or cuttle-fishes, and the teeth are of just the formation to hold the slippery prey ; and, once they are gripped, there is no escape.

The Cachalot is always dangerous when wounded ; and in the old whaling days boats were often smashed by blows of the enormous flukes, or crunched by the jaws of a maddened animal. One Whale, indeed, was known to have destroyed nine boats in rapid succession. Solitary bulls are often belligerent, and will occasionally ram vessels without any cause of offence ; full-rigged sailing ships have been sent to the bottom by the crushing charge of a Whale, filled with vengeful fury. With steam-driven vessels the cetacean is likely to come to grief, if it meet the supposed foe end on. On March 10, 1910, the famous ocean greyhound, Kaiser Wilhelm II, collided with a Whale in the Atlantic. The prow of the vessel impaled the monster and drove through the water with it for a considerable distance. It was only by putting the engines full speed astern, that the vessel was able to get free from the dead leviathan.

The Bottle-nose Whale (*Hyperoödon rostratus*) is a North Atlantic species that is stranded on British coasts more often than any other Whale. Measuring from twenty-four to thirty feet in length, a full-grown male will yield a couple of tons of oil and two hundred-weights of spermaceti. This animal gains its name from the shape of its head, which rises abruptly from a rather short, beak-like mouth ; but it must not be confused with several smaller species, which are known as Beaked Whales.

FAMILY : DELPHINIDÆ

THE NARWHAL (*Monodon monoceros*)

There are considerably more species in the Delphinidæ, than in the preceding families ; but even its biggest members are only of moderate size. They do not possess the disproportionate head of the true whales, and with few exceptions they have teeth in both jaws.

The Narwhal, an Arctic animal, and the strangest-looking of the family, attains a length of fourteen or fifteen feet. In the upper jaw of a young animal are two small hollow tusks, which in the case of a female remain small throughout its entire life. In the male, however, the left tusk develops into a spirally twisted yellow ivory spear, eight or nine feet in length ; only occasionally is it the right tusk that is thus developed, and still more rarely is an animal

found with two spears. The use of this quite singular tusk is rather obscure. If it were intended to serve in the procuring of food, the female would need it as much as the opposite sex ; and it is only a plausible suggestion that the weapon is used as an auger for boring breathing-holes through the ice fields. Its chief purpose appears to be as an offensive weapon, with which the males fight among each other for their mates, in which it would be analogous to the antlers of the deer, the combats in the breeding season resulting in only the finest and strongest males securing partners. The Narwhal yields oil that is of finer quality than that of the whale, and the ivory is of considerable value, and would be more so if the horns were solid.

THE WHITE WHALE (*Delphinapterus leucas*)

The White Whale, or Beluga, is another Arctic inhabitant, although it sometimes ventures into temperate waters. One was seen daily in the Firth of Forth for nearly three months before it was captured ; another was found in a river near Dunrobin at ebb tide with its flukes accidentally held securely by a couple of net stakes. Along the shores of the Arctic Ocean, the animal commonly leaves the sea and scours far up the river mouths in pursuit of salmon and other fish. The Beluga is generally about sixteen feet long and is a creamy white in colour. It yields useful oil ; and the hide makes strong, soft leather, which is styled 'porpoise-hide' in trade circles. The natives of the frozen north esteem the flesh ; the Greenlanders dry it for winter use ; and in Siberia it forms the staple food of the Eskimo dogs.

THE DOLPHIN (*Delphinus delphis*)

There are numerous species of true Dolphin that are found in various widely separated waters ; but the Common Dolphin is typical of all of them, and frequents temperate and tropical waters alike. It averages six or seven feet in length. The head narrows into a beak-like muzzle, resembling the fish more than any other members of the family. The jaws are armed with about a hundred teeth, top and bottom interlocking. As with most of the family, only one young one is produced at a birth, and the female tends it with the most affectionate care.

The Dolphin is a gregarious, lively, and playful creature ; and is in the habit of accompanying ships for considerable distances, gambolling among the waves and engaging in various sports that are highly diverting to onlookers. It works considerable havoc among the shoals of fish that visit our coasts, and in consequence is viewed as an enemy by the fishing fraternity, especially for the damage which it often causes to nets.

The Bottle-nosed Dolphin (*D. globiceps*) is rather a rare visitor to our shores, although its habitat is the North Atlantic. One

captured in the River Dart, about three miles above the mouth, fought for its life for four hours against eight men armed with spears and guns, and assisted by dogs. While struggling with its foes it bellowed loudly, making a sound something like that of an enraged bull. It proved to be more than eleven feet in length.

THE PORPOISE (*Phocæna communis*)

The Porpoise has a wide distribution in the North Atlantic and North Pacific Oceans; it is common in the North Sea around the British coasts, but rarely visits the Mediterranean. The length of a full-grown Porpoise is extremely variable, the average being from five to seven feet. The upper surface of its body is blue-black in colour, with the underparts a bright silvery white. The Porpoise is a very sociable animal, herding in large shoals, and destroying



PORPOISE

Photo A. S. Rudland

enormous quantities of herrings, pilchards, sprats, etc. Very often when a shoal of saleable fish approaches close to the shore, it is in the vain attempt to escape the formidable teeth of the Porpoise, to which even salmon and other large fish frequently fall victims. In olden times the flesh of the Porpoise was considered a regal dish, but British sailors will not eat the coarse and unpleasant food unless they are on short rations. The skin is manufactured into useful leather, but, as before stated, the porpoise-hide that is so impervious to water, and therefore particularly serviceable for shoe-leather, is usually the skin of the white whale.

THE KILLER WHALE (*Orca gladiator*)

The Killer Whale, or Grampus, frequently exceeds twenty feet in length, and is easily the most ferocious of the Dolphin family. Its range is world-wide, from Greenland to Australia. Occasionally it ascends tidal rivers. In 1772 a Grampus was harpooned in the Thames; twice it dragged the boat from Blackwall to Greenwich before it was despatched. Only a few years ago three of these animals were observed swimming between Chelsea and Battersea

Bridges. In all probability they returned safely to the sea, as there is no record of their capture.

The Grampus is the wolf of the ocean. Plagued with an insatiable appetite, it constantly preys not only upon the larger fish, but also upon other marine mammals. The Beluga falls an easy victim ; but half a dozen Killers, aided by threshers and sword-fish, will attack even a Greenland Whale, and when they have disabled the monster will first gorge themselves upon its huge succulent tongue.

ORDER : EDENTATA

THE TOOTHLESS ANIMALS

Notwithstanding the title of this Order some of its members are not toothless ; but no single Edentate possesses any teeth in front, and the cheek teeth are always destitute of roots and enamel. In other respects the animals present marked divergences in shape and still more in habits : some are arboreal and confine themselves strictly to a vegetable diet, while others are burrowers, subsisting on flesh or insects. From whatever aspect we view them, the Edentates form one of the most remarkable groups of the animal kingdom.

FAMILY : BRADYPODIDÆ

THE THREE-TOED SLOTH (*Bradypus tridactylus*)

A native of tropical South America, the Three-toed Sloth, or Ai, is a shaggily clothed animal, about two feet in length. Its coarse hair is mainly brownish grey in colour, but between the shoulders sometimes appears an oval patch, edged with brown or orange, which is only the result of the animal rubbing itself against tree trunks and exposing a portion of its woolly under-fur. In one respect the coat is exceedingly peculiar : a vegetable alga attaches itself to the hairs and flourishes well in the moist, tropical atmosphere, rendering the Sloth very difficult to perceive amid its leafy surroundings.

The head of the animal is short and round ; the eyes are small and dull ; the hearing is not very acute ; and there are ten teeth in the upper and eight in the lower jaw. The toes of the Sloth are armed with remarkable claws. They are so long and incurved as almost to prevent the animal walking, unless it literally pulls itself along by hitching its claws in depressions in the ground. But the Sloth is a tree dweller. Using its claws as mere hooks, it is a most accomplished climber, and it never descends to the ground if it can pass from one tree to another without the effort of walking. In another respect the Three-toed Sloth is unique among the mammals : it possesses nine vertebræ in the neck, giving it unusual flexibility, by which the animal can turn its head almost completely round without any movement of the body.



PLATE XIV

Kangaroo
Sloth

The Sloth is nocturnal in habit, and exists on leaves, buds, and young shoots. It sleeps while suspended by its claws from a branch, with its body rolled into a ball, the alga-infested hair giving it the appearance of a bundle of lichens. Its flesh is tender and palatable, and is considered a great delicacy by the South American Indians, who hunt it remorselessly for food ; but the creature's constant enemy is the serpent. The Sloth is very tenacious of life ; the severest bodily injuries fail to kill it ; it can endure for long periods without food ; and a dose of poison that would kill most quadrupeds outright appears to have no effect upon it.

There are two species of Two-toed Sloth very similar in habit, one of which has seven vertebræ in the neck, while the other has only six.

FAMILY : MYRMECOPHAGIDÆ

THE GREAT ANT-EATER (*Myrmecophaga jubata*)

The Great Ant-Eater, or Ant Bear, of Central and South America, is entirely destitute of teeth. It has a remarkably narrow and elongated head, and its mouth is furnished with a viscid tongue,



GREAT ANT-EATER

which it can protrude to a length of over twelve inches. Its forefeet are provided with long, curved claws, which are a hindrance to rapid locomotion, even when the animal folds them upon a rough pad which is placed in the palm. The hinder claws are shorter,

but as the Ant Bear is forced to walk on the outer edge of its fore-feet, its gait is very awkward. The body of the animal is four feet long, and is clothed with thick, long, coarse hair ; it is principally brown in colour, mingled with grey on the head and face, and with many long white hairs on the body and tail ; the throat is black, and from it a triangular black mark, edged with white, passes obliquely upwards and backwards over the shoulders. The tail is two and a half feet long, and is heavily plumed.

The Ant Bear, or Tamanoir, exists upon insect food, especially ants and termites. With its powerful claws it makes short work of ant-hills, breaking open the stout walls ; and then with its long tongue, which resembles a great red earth-worm, it licks up the insect delicacy. Unless it is called upon to defend itself the animal is quite inoffensive. If it can seize a human opponent between its fore-limbs, the long claws are capable of stabbing him to the heart. It is often claimed that the awkward animal can hold its own with the jaguar ; but even taking the claws into fullest account it is improbable that a toothless hobbler could withstand the spring and the fiercely clawing stroke of the American tiger. The female Ant Bear carries her young one on her back for an inordinately long time, not infrequently till another young animal arrives, and causes it to shift its quarters to the ground alongside its patient dam.

The Little Ant-Eater (*Tamandua tetradactyla*), about half the size of the foregoing, is a much commoner animal. The entire body is clothed with short, bristly hair, suggestive of an Ant Bear closely clipped from head to tail. It is a much more active animal, and is a good tree climber, in which it is assisted by its prehensile tail, which is naked and scaly at the tip.

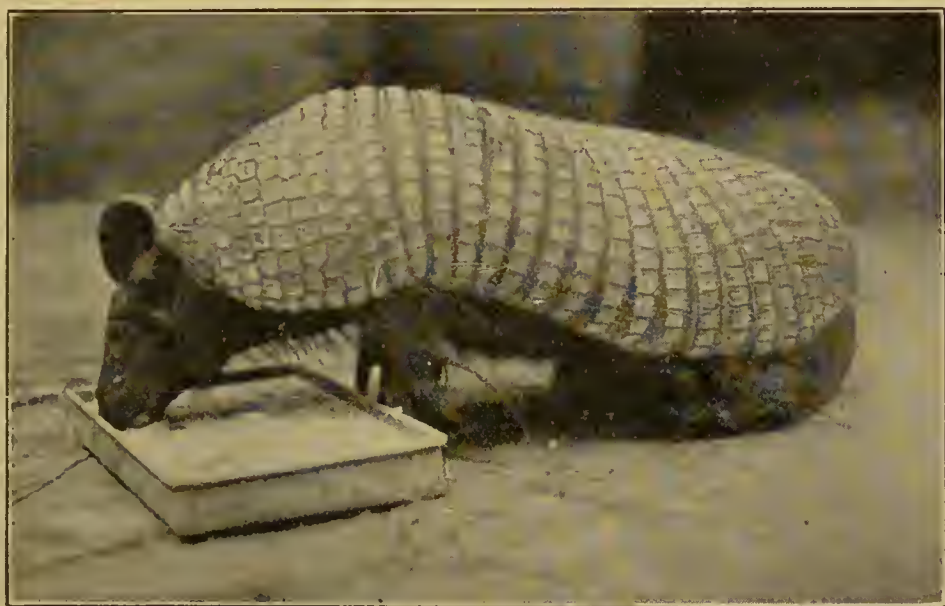
FAMILY : DASYPODIDÆ

THE ARMADILLOS

The members of this family are comparatively small animals, a dozen species of which are tolerably common throughout Central and Southern America. Upon their back is laid a natural armour, consisting of plates of horn connected by bony rings in such a manner as to allow perfect freedom of movement. Hair often grows out between the plates. Some of the species are purely insectivorous in diet ; but others are blessed with omnivorous tastes, eating vegetable or animal food alike, and its putridity is no bar to appetite. Really the Armadillo tribe renders good service in removing decaying animal matter ; and on the plains are often to be found dead horses, cattle, and sheep upon which the armoured scavengers can demonstrate their useful qualities. The animals are armed with powerful claws for burrowing, and in some regions

the natives have to bury their dead with special care, for unless the grave is lined with stout boards or stones the corpse will be in danger of a visit from a too pertinacious scavenger. Darwin tells us that in order to catch an Armadillo it is necessary to alight from one's horse quickly, or its hind-quarters will have disappeared underneath the soft soil before it can be reached. Insects, eggs, ground birds, and reptiles are all welcomed by the Armadillo. A snake is quite helpless against the jagged edges of the armour, which the quadruped presses into the reptile until it succumbs. It then devours its victim, commencing at the tail and eating onwards. Nearly all the Armadillos live in burrows, from which they rarely issue in the daytime. Europeans do not care for the strong and rank flesh of the burrower, but in many South American restaurants roast Armadillo is a popular dish.

The Great Armadillo (*Priodon giges*), nearly three feet in length, is the largest of the family. Even its tail is encased in bony rings, but notwithstanding its coat of armour and its awkward-looking



BROAD-BANDED ARMADILLO

claws, it can run with perfect ease. The Broad-banded Armadillo, or Tatouay (*Lysurius unicinctus*), the second in size, is about eighteen inches in length; but the Pichiago (*Chlamydomorphus truncatus*), the smallest, only measures five inches.

FAMILY : MANIDÆ

THE PANGOLINS

The Pangolins are more remarkably clothed than even the Armadillos, overlapping scales, fir-cone fashion, taking the place of the

armour-plates. These scaly, toothless ant-eaters are found only in Asia and Africa, and they possess well-armed feet for breaking into ant-hills and for burrowing generally.

The Indian Pangolin (*Manis pentadactyla*) is two feet long in the body, and is scaled to its claws and to the tip of its tail. The scales have been known to resist a revolver-shot at very short range, the concussion only knocking the creature off its feet and causing it to roll itself into a ball. The Long-tailed Pangolin, or Phatagin (*M. tetradactyla*), of West Africa, is five feet long, including the tail. Though the tail is scaled above and below, the underpart of the body is bare ; but by rolling itself up the animal covers this vulnerable part.

FAMILY : ORYCTEROPIDÆ

THE AARD-VARK (*Orycteropus capensis*)

'Earth-pig,' the name which the Boers apply to the Cape Aardvark, appears to be a suitable appellation for the curious animal, with its pig-like brown body, thinly covered with coarse bristly



AARD-VARK

hair, long narrow snout, and large ears. There the resemblance to the swine ceases, for its feet terminate in claws almost equal to those of the Tamanoir, its tongue is extensile, and the long, cylindrical, tapering tail gives a reptilian touch to a singularly unprepossessing

animal. The Aard-vark can dig its large but shallow burrow in the sun-baked earth faster than a man could execute the task with a spade. It only issues from its home at night to pay its destructive visits to ant-hills.

The Ethiopian Aard-vark (*O. æthiopicus*) is a similar but less-known animal ; it has a shorter head and ears, and a thinner coating of hair.

ORDER : MARSUPIALIA

THE POUCHED ANIMALS

In this order are grouped together a number of extraordinary animals that, with one exception, are inhabitants of Australia and a few adjacent islands. Many of the species are very unlike each other in external appearance. Not a few of them would pass for members of other orders of the mammalia, e.g., the Wombat somewhat resembles the marmot ; the Bandicoot is not unlike one of the Insectivora ; the Opossums and Phalangers in many respects are arboreal Rodents ; the Thylacine and the Native Cats are bloodthirsty carnivores in habit ; and the Kangaroo, most typical Marsupial of all, is quite deer-like in its head and eyes, its coat and diet.

All of these animals, however, possess the distinguishing characteristic that separates them from any other order. The Latin word, *marsupium*, means a pouch or bag, and the teats of the female marsupials are situated in a receptacle in the lower part of the abdomen. The young are born in a very immature state, and are at once placed by the mother in the pouch ; and there they remain until they are agile enough to take care of themselves. The style of the pouch varies in different species ; in some it opens forwards, in others, backwards ; and a few have only a fold in the skin, the merest apology for a bag. The Marsupials are provided with two special fork-like bones, which issue from the pelvis, and are directed forwards and upwards, almost parallel with the spine. At first sight this appears to be a provision to relieve the drag of a laden pouch upon the skin and walls of the abdomen ; but the opinion is rather discounted by the fact that the male animals also possess these bones.

FAMILY : MACROPODIDÆ

THE GREAT GREY KANGAROO (*Macropus giganteus*)

The Great Grey Kangaroo, the largest and best known of several species, was very abundant in Australia when it was first seen by Europeans. A full-grown male often exceeds four feet in length, exclusive of the tail, which measures an additional three feet. The strong hind legs, three and a half feet long, are terminated by stout feet with four toes, each strongly clawed ; but the fourth toe in

particular is developed into a long, solid nail, nearly twelve inches in length, and forming a formidable offensive weapon. The forelimbs are only half the length of the hinder ones, and are used chiefly as hands. When the animal sits up, supported on its hind feet and tail, tripodal fashion, its height is rather more than four feet, but when it stands erect, it is as tall as a well-grown man. The female is so much smaller that she might be taken for an entirely different species. The colour of the rather woolly fur is brown mingled with grey, the latter colour predominating on the underparts of the body. The fore-feet and the tip of the tail are black. The eye of the animal is very beautiful, large, round, and soft, and gives to it a gentle, gazelle-like expression that com-

pensates for the rather savage aspect of the teeth, as they gleam whitely between the cleft lips.

The Kangaroo goes awkwardly on all fours when grazing or walking short distances, but its mode of travelling, especially when alarmed, is by a series of hops, each leap measuring about fifteen feet. In this method of progression it gets up an enormous speed, and in full flight it clears bushes or fences nine feet in height.

There is only one young Kangaroo at a birth. When first born, it is very minute, hardly exceeding



TREE KANGAROOS

an inch in length, soft, helpless, and semi-transparent as an earthworm. Its mother places it in her pouch, and it in-

instinctively attaches itself to one of the nipples. Until the tiny creature is strong enough to suck for itself the mother injects the milk into its mouth by contracting a muscle of the mammary gland. In this internal cradle the young Kangaroo passes the whole of its earlier stages of development. By degrees it gains sufficient strength to poke out its head, and to crop the more delicate herbage, and at length ventures outside under the watchful protection of its mother. No sooner is the little animal tired, or does danger threaten, than it scrambles back into the pouch, and does not emerge until it is refreshed by repose, or until all danger has passed away.

A full-grown male Kangaroo is termed a 'Boomer,' 'Old Man,' or 'Forester'; the female, before she has borne young, is called a 'Flying Doe'; while the very young animal is known as 'Joey.' Hunting a 'Boomer' with rough-haired greyhounds, specially trained and called Kangaroo dogs, is an exciting sport, in which our native foxhounds would be quite outclassed. Within the space of a couple of hours a 'Boomer' will lead the field for close upon twenty miles, and at the end of the run will still prove a foe worthy of respect. With its back to a tree it will use its great cutting claw with terrible effect; frequently hounds are killed outright, or at least maimed for life. Often the desperate animal will make its final stand in a waterhole, where, waist-deep, it will await the approach of dogs or men. In the water, a dog is handicapped practically out of the contest, for the Kangaroo will seize a hound with its fore-paws, and deliberately hold its head under water until it is drowned; and a man who ventures into the hole will seldom escape a rough-and-tumble ducking.

This method of hunting the Kangaroo is akin to our British fox-hunting; but when the animal is chased for food, for the sake of its skin, or to thin the numbers of marsupials who are eating the pasturage required for the sheep, driving is the method chiefly employed. The hunters form a cordon round the tract frequented by the gregarious Kangaroos, which are urged forward into a huge pen, specially fenced so as to defeat the leaping powers of the hunted animals. Once they are in the doomed enclosure, gun and club speedily end the battue. The flesh of the Kangaroo family is more or less eatable; the loins are particularly tender, and good steaks can be cut from the hind-quarters; but Kangaroo-tail soup is a dish for gourmands.

Of the two dozen species, the Woolly or Red Kangaroo (*M. rufus*) runs the foregoing animal closely in size; it is a native of rocky districts rather than of the plains.

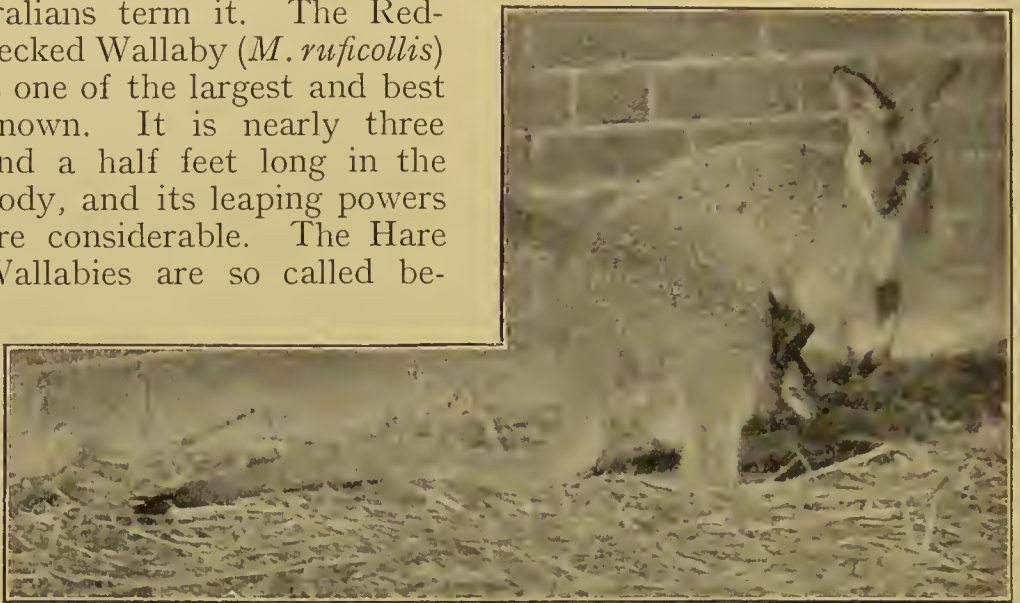
The Tree Kangaroo (*Dendrolagus ursinus*) is a much smaller species; there is but little difference between the length of the fore and hind limbs; and the hind foot is not armed with the terrible

cutting nail. Although its feet are not specially modified for climbing, it spends the greater part of its time in high trees. There are three species, all of them natives of Queensland and New Guinea.

The Kangaroo thrives well in England. Most of the animals that have been in the Zoological Gardens have bred regularly ; and at Tring Park, Lord Rothschild has a troop of these graceful creatures, apparently as happy as the deer.

THE WALLABIES

These animals, of which there are many species and varieties, are but smaller and more brightly clothed Kangaroos. The largest of them are called Brush Kangaroos, because they frequent scrubby jungle, or 'brush' as Australians term it. The Red-necked Wallaby (*M. ruficollis*) is one of the largest and best known. It is nearly three and a half feet long in the body, and its leaping powers are considerable. The Hare Wallabies are so called be-



RED-NECKED WALLABY

cause of their resemblance to the common hare ; and the Rock Wallabies select rocky ground for their habitat.

The Rat Kangaroo, or Potoroo, of which there are nine species, is a small animal, never exceeding a rabbit in size, and most of them are even less. Some of them have prehensile tails, and make nests in trees ; but in all essential respects any Potoroo is a Kangaroo in miniature. It is said that the flesh resembles that of rabbit, and the Australian blacks view it with much approval ; but Europeans, owing to its name, associate it with the common rat, and do not care to partake of it.

FAMILY : PHALANGITIDÆ

THE PHALANGERS

The Phalanger family comprises rather numerous species, ranging in size from that of a mouse to that of an ordinary cat, thickly clothed with hair, and with one exception carrying a long and more or less prehensile tail. Though many of the animals differ considerably in appearance, their common and distinguishing characteristic is the union of the second and third toes of the hind foot ; and the claws are of the type specially adapted for climbing. They are chiefly nocturnal, and all are arboreal ; a few of them are herbivorous in diet, but the majority are omnivorous, with a marked liking for insects, small birds, etc. It must be noted that in Australia several of the species are called ' Opossums,' and the larger ones are systematically hunted for their fur.

THE SPOTTED CUSCUS (*Phalanger maculatus*)

The Cuscuses inhabit various Indo-Malayan islands, and are among the few marsupials to be found in regions where representatives of other mammalian orders abound. The Spotted Cuscus is the handsomest of the family. The ground tint of the fur is whitish grey, upon which are placed irregular blotches of reddish chestnut, but the animal varies considerably from grey to almost red. The tail is remarkably prehensile, and is quite bare approaching the tip. The feet are strongly clawed, and the hinder ones are furnished with fleshy pads. Hunting by night, it is a terrible foe to small animals and birds, although it also feeds largely upon leaves. The Cuscus, though rather slow and cautious of movement, is particularly difficult to kill on account of the thickness and looseness of its fur.

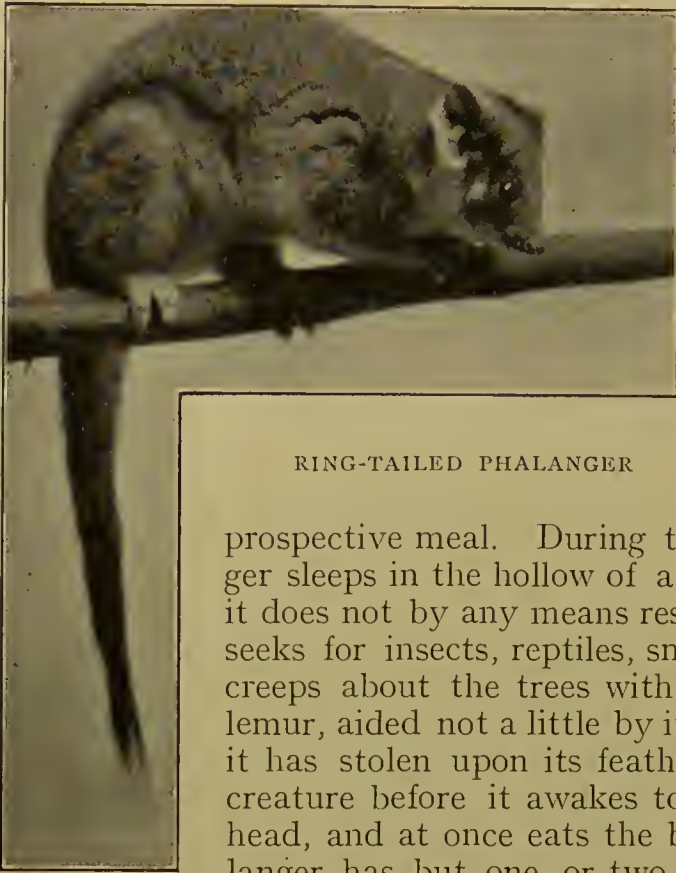


SPOTTED CUSCUS

"A heavy charge of shot," says Mr. Wallace, "will often lodge in the skin and do them no harm, and even breaking the spine or piercing the brain will not kill them for some hours. The natives everywhere eat their flesh, so that it is wonderful they have not been exterminated. It may be, however, that their dense woolly fur protects them from birds of prey, and the islands they live in are too thinly inhabited for man to be able to exterminate them."

THE COMMON PHALANGER (*Trichosurus vulpecula*)

The Common, or Vulpine, Phalanger is about a foot and a half in length without the tail, which is twelve inches long. Its fur is brownish grey above and yellowish white below; the ears are white and the tail black. In general appearance this Australian 'opossum' is distinctly fox-like, hence its specific name. The animal feeds largely upon the leaves of the peppermint gum, and its flesh



RING-TAILED PHALANGER

is impregnated with this flavour, or that of other perfumed leaves upon which at the time it is browsing. Europeans, therefore, do not fancy the flesh; but the Australian aborigine is less particular; and when he is assured that a 'possum' is in a certain tree, he will fell it rather than miss the

prospective meal. During the daytime the Phalanger sleeps in the hollow of a tree. Issuing at night, it does not by any means restrict itself to leaves, but seeks for insects, reptiles, small birds, and eggs. It creeps about the trees with the noiselessness of the lemur, aided not a little by its prehensile tail. When it has stolen upon its feathered prey, it seizes the creature before it awakes to the danger, crushes its head, and at once eats the brain. The female Phalanger has but one or two young ones at a birth, which spend the earlier portion of their existence in her pouch; and when they are strong enough to leave the shelter they are carried about on the mother's back.

The Ring-tailed Phalanger (*Pseudochirus herbertensis*) is an entirely separate species, with marked differences in the teeth and in the white-tipped tail, which is not only more tapering, but is

naked on its under surface near the tip. It is the only animal of the tribe that constructs a nest in the thick scrub or up in a tall tree.

THE FLYING PHALANGERS

The Flying Phalangers are very similar to the foregoing animals, except that they possess a well-developed skinfold, extending along each flank from the wrist to the ankle. Trusting to the supporting powers of this hairy membrane and the exceedingly bushy and non-prehensile tail, one of these creatures can pass from one tree to another without the trouble of descending and climbing up again. Boldly launching itself into the air and stretching out its limbs and expanding the skin to the utmost, it can sweep through a considerable interval of space. It possesses no small power of altering its course at will by means of the tail, which acts at once as a balance and a rudder. It cannot, however, support itself in the air by moving its limbs, nor can it make any aerial progress when the original impetus of its leap has expired. If a Flying Phalanger were to mingle with some of the flying rodents referred to in earlier pages, the unpractised eye would fail to separate the Australian animal from its companions.

The Great Flying Phalanger (*Petauroides volans*), twenty inches in length without the tail, is clothed in a blackish-brown, silky coat, with white on the underparts. In this species the flying membrane is less prominent than in some of the smaller animals.

The Squirrel-like Phalanger (*Petaurus scirius*), called also the Sugar Squirrel and the Squirrel Opossum, is widely known in Eastern Australia. It is a pretty little creature, eighteen to twenty inches in length, of which the tail forms a little more than half. Its beautiful fur is chiefly ashy grey above and white beneath; a narrow



SUGAR SQUIRREL

dark stripe runs from the point of the nose and along the back to the root of the tail. The whole covering is remarkably soft in texture. The Sugar Squirrel, like most of its tribe, is nocturnal, remaining concealed in a hollow branch during the hours of daylight. As soon as evening approaches it becomes exceedingly frolicsome, darting from tree to tree, and going through the most extraordinary and daring evolutions with admirable ease. Starting from an elevation of only thirty feet, it has been known to leap fairly across a river forty yards in width.

The Pigmy Flying Phalanger (*Acrobates pygmæa*) is only five inches in total length, and its tail of two and a half inches is haired like the vanes of a feather. Though so tiny, the female is a true marsupial, bearing a well-marked pouch in which are four teats to accommodate her minute young ones.

THE KOALA (*Phascolarctus cinereus*)

The Koala, or Australian Bear, is a quaint-looking animal, differing so greatly from the true Phalangers that it is referred to a separate sub-family. It is a living representation of the nursery 'Teddy-bear,' with its short head, tufted ears, and thick, woolly, ashy-grey coat. Its tailless body is about two feet in length. It usually spends the day high up in a tall tree, coiling itself upon a branch, tucking in its head and limbs until it is difficult to distinguish it from the surrounding vegetation of the gum forest. The Koala generally goes about in pairs. When the young one is old enough to leave its mother's pouch, she transfers her offspring to her back, where it clings with its hand-like paws, the couple presenting the drollest appearance when a tree is being climbed. Even in a wild state the animal is gentle and sedentary, never troubling to leave a tree as long as there are sufficient leaves to satisfy its appetite. Captivity does not appear to trouble it, and the quaint little creature is a common household pet in the south-east of Australia.

FAMILY : PHASCOLOMYIDÆ

THE WOMBAT (*Phascolomys mitchelli*)

The Common Wombat of South and Eastern Australia is often called the Australian Badger. It is covered with coarse hair, varying from brownish grey to yellow or even black ; it burrows a dwelling-place like the badger ; it has powerful incisor teeth ; and its partially webbed hind feet render it almost as aquatic as the beaver. In crossing a river it often prefers to walk on the bottom to save it the extra exertion called for in swimming. With its heavy body, three feet in length, supported on short legs, the Wombat is by no means active, and trudges along with a heavy, rolling waddle. Its flesh is tolerably good, somewhat resembling lean

mutton ; and as a well-grown animal weighs a hundred and forty pounds it is well worth the trouble entailed in its capture. A hunter, however, will generally think twice before deciding to dig the animal out of its deep burrow, unless he is desirous of some rather heavy spade-work. A Wombat hide, with the thick harsh fur left on, makes an almost indestructible door-mat.



WOMBAT

FAMILY : PERAMELIDÆ

THE RABBIT-EARED BANDICOOT (*Peragale lagotis*)

There are eight or nine species of Bandicoot found throughout the length and breadth of Australia, Tasmania, and in some por-



RABBIT-EARED BANDICOOT

tions of New Guinea. Although they eat worms and insects they are omnivorous in diet, doing immense damage in cultivated tracts, for which they are cordially hated by the agriculturist. The Rabbit-eared Bandicoot's silky hair is pale grey on the back, rufous on the sides, and white underneath. It is about the size of a rabbit, and its pace is equally swift; but except for the kangaroo-like hind legs the general appearance is more suggestive of a large shrew. The Bandicoot usually lives in a burrow, but a few species construct nests. For the damage it works in fields and grain stores the animal may be likened to the rat; but for the sufferer from its depredations there is at least some consolation in the fact that the little animal's flesh is delicious, especially if cooked in the native style, that is, with the hair removed, and the game roasted on the coals.

FAMILY: DASYURIDÆ

Except for the characteristic marsupial pouch, the members of this family might well be included in the list of typical carnivores, for they possess numerous sharp-edged and pointed teeth, well calculated to hold and tear the flesh of a struggling captive. The larger species are absolutely carnivorous in taste, while the smaller ones live largely upon insects.

THE SPOTTED DASYURE (*Dasyurus maculatus*)

The Spotted Dasyure is representative of several animals, which the Australian colonists call Native Cats, although some of them are no bigger than an ordinary rat. In appearance some of them are decidedly mild of aspect, but in temperament they are almost as bloodthirsty as any member of the weasel tribe. The Spotted Dasyure is generally chocolate-brown in colour, diversified with many spots of white scattered over the whole of the body, but varying in size and position in different individuals. The long tail is not prehensile. It is a nocturnal and arboreal animal, not leaving a hollow gum tree until the sun is below the horizon. Smaller quadrupeds, birds, and insects are vigorously preyed upon, and if an outlying henroost is visited, the settler will be bewailing the depletion of his feathered stock in the morning.

THE TASMANIAN DEVIL (*Dasyurus ursinus*)

This animal acts up to its name, which is plainly suggestive of an intensely bad character. About twenty-one inches long in the body, with a tail one-third of that length, the Tasmanian Devil resembles a large-headed, bluntly-muzzled, ugly badger. Its coat is chiefly a deep, dead black, with a redeeming band of white across the chest, often extending almost to the shoulders; sometimes the flanks are sprinkled with white hairs. Issuing at night from a

natural cleft in the rocks or a burrow of its own excavation, the Ursine Dasyure, for its size, is terribly destructive to all animal life that it can overpower. The introduction of sheep into Tasmania provided the ferocious little beast with a welcome addition to its



TASMANIAN DEVIL

ordinary menu, and the colonists were forced to take measures to exterminate an absolute menace to their prosperity. In the more settled regions the animal is now practically non-existent.

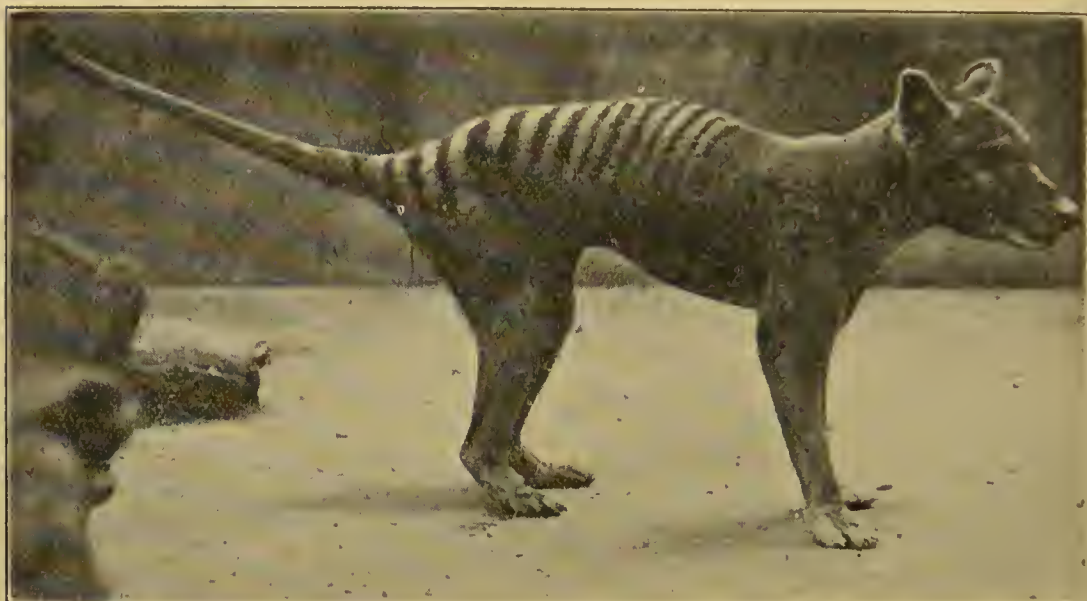
The innate ferocity of the creature can hardly be conceived except by those who have had personal experience of its demeanour. Even in captivity its sullen and purposeless anger is continually excited, and the animal appears to be quite obtuse to kindness. Generally, a caged animal soon learns to recognise its keeper, and to welcome the hand that supplies it with food, but the Tasmanian Devil seems to be diabolically devoid of gratitude, and attacks indiscriminately every being that approaches it.

THE THYLACINE (*Thylacinus cynocephalus*)

The Thylacine, or Tasmanian Wolf, the largest of the Dasyures, might easily be taken for a member of the canine family; but the female is furnished with a pouch which opens backwards, although the marsupial bones are absent, being represented only by cartilages. The animal is about four feet in length, including the tail of sixteen inches, or about the size of the jackal; sometimes it attains a total length of six feet, but even then it is a smaller animal than the European wolf. It is greyish brown in colour, washed with

yellow, and from just behind the shoulders to the root of the tail the back is marked with transverse black stripes, that have gained for it the name Zebra Wolf, although the colonists frequently call it the 'tiger.'

Though it is not a particularly quick animal, the Thylacine preys upon the smaller kangaroos ; the duckbill, even with the advan-



THYLACINE

tage of aquatic habits and a deep burrow, often falls a victim ; and, stranger still, a panoply of bayonet-like prickles cannot save the echidna. In the early days of the colonisation of Tasmania the Thylacine outvied the Native Devil in its voracious attacks upon the sheep, and consequently this animal, too, received scant mercy at the hands of the settlers ; and it is now to be found only in the more remote mountainous regions. When hunted, it is fierce and desperate to the last degree, and no single dog would dare venture within reach of its teeth. In captivity the Thylacine does not exhibit the unreasoning ferocity of its near relation, the Ursine Dasyure, and animals in the Zoological Gardens have speedily become friendly with their keepers.

FAMILY : DIDELPHIDÆ

THE OPOSSUMS

The Opossums are small, tree-dwelling mammals, existing principally upon a mixed diet of vegetable food, birds, eggs, insects, and the smallest quadrupeds. They are sharp-muzzled and thickly furred ; the first toe of each front foot is not clawed like the others, but is prehensile, as is also the long, naked tail. The family is

remarkable among the marsupiated animals, because it is the only one that is not Australian. In appearance and habits these creatures much resemble the true phalangers, which, as before stated, are often confused with them.

The Virginian Opossum (*Didelphys virginiana*) is a native of the southern United States of America. About three feet in length, including the tail of twelve inches, it is equal in size to a stoutly built cat. Its woolly hair is greyish white tinged with yellow. It is a voracious and destructive animal, prying into every nook and corner in hope of finding something to satisfy the cravings of perpetual hunger. Young birds, eggs, the smaller quadrupeds—such as young rabbits, which it eats by the brood at a time, cotton rats and mice—reptiles of various kinds, and insects, fall victims to the appetite of the Virginian Opossum. It is not content with the food which it finds in the open forests, but must needs insinuate itself into the poultry yard and make a meal on the fowls and their eggs.

The nest of the Opossum is always made in some protected situation, such as the hollow of a fallen or a standing tree, or under the shelter of some old projecting roots. When the dozen or more young Opossums are born, they each weigh about four grains, and the total length does not exceed an inch. Placed in the mother's cradle pouch, at the end of a week they weigh thirty grains; and by the time they are five weeks old they will climb on to the mother's back, to which they cling with their little claws, twisting their tails round the bigger appendage which the old one curls conveniently within their reach.

The Opossum is second to none in pertinacity, and its cunning is as proverbial as that of the fox. When captured, it immediately shams death—its jaws open, its tongue extended, its eyes dimmed. Even if kicked and beaten, it will not quiver a muscle or flicker an eyelid. But let its tormentor remove his gaze for a moment, and the presumed dead animal will speedily make tracks for safety.

Merian's Opossum (*D. dorsigerus*) of Surinam, with a body only six inches in length, is quite mouse-like. The pouch of the female is only a mere fold of skin, and consequently the young ones have recourse to their mother's back at an earlier age than some of their bigger cousins.

The Water Opossum (*D. cancrivorus*) of the regions between Brazil and Guatemala, has short close fur, and its hind feet are webbed. It lives upon fish, crustaceans and small aquatic animals. Its habits may be gathered from the fact that the earlier naturalists classed it with the otters.

ORDER : MONOTREMATA
THE EGG-LAYING MAMMALS

The two animals that are now presented for consideration seem to transfer us almost into the domain of the reptiles. In the Marsupialia the young are brought into the world in a particularly immature and helpless state ; in the Monotremata the young are produced from eggs, but from the point when they are hatched, they follow the marsupial custom.

THE DUCKBILL (*Ornithorhynchus anatinus*)

The Duckbill, Platypus, or Water Mole, is an extraordinary burrowing and aquatic animal, in the evolution of which Nature might almost be suspected of conniving at a practical joke. Zoologists at different times have been sorely puzzled how to classify some animals, e.g. the hyæna may be placed either with the cats



DUCKBILL

or dogs, the badger with the bears or weasels, and the chamois with the goats or antelopes ; but the Duckbill possesses points that seem to be a strange admixture of beast, bird, and reptile.

The animal is about twenty inches in length, from the tip of its duck-like bill to the end of its tail. The body, oval-shaped and depressed, is clothed with short, dark brown, rather mole-like fur. The skin is so loose that its owner can push through a very small aperture ; this looseness also makes it difficult to kill the creature even by gun-shots. The bill is put to the same uses as that of the duck, namely, grubbing in mud for molluscs, worms, insects, etc. The base of it is furnished with a funnel-like shield to protect the eyes. The tail, though haired, is something like the appendage of the beaver, and is used as a rudder. The hind feet are webbed to the bases of the claws ; but the webbing of the fore-feet extends

considerably beyond their tips, as shown in the photograph. The webbing is no bar to burrowing, for the animal can turn it back upon the palm ; and a Duckbill has been seen to excavate a burrow, two feet long, in hard gravelly soil, within the space of ten minutes.

The Platypus is nocturnal and extremely shy. It usually lives in pairs in a burrow, often fifty feet in length, which has one opening under water, while the land entrance is hidden in a neighbouring thicket. The nest is only a bundle of weeds thrown carelessly together, in which the female deposits two soft-shelled eggs, each about three-quarters of an inch in length. When the young are hatched the bill is very short and quite fleshy at its edges, so as to allow the tiny, naked and blind creature to take milk from the glands which are situated in the mother's simple skinfold.

THE ECHIDNA (*Echidna aculeata*)

The Echidna, or Porcupine Ant-Eater, at first glance might be taken for a cousin of the hedgehog or porcupine, for the upper portion of the head and body is clothed with innumerable short, thick spines, with stiff hairs on the underparts. It is a toothless



ECHIDNA

animal, possessing the powerful claws and the extensile glutinous tongue of the true ant-eaters. Its head is small, and has a slender, elongated snout. The pouch of the female Echidna is only a skinfold in the abdomen, in which she places one egg with a white and leathery shell, which remains there until it is hatched. The young Echidna is sheltered in the pouch for several weeks, by which time it is about four inches in length. The home of the animal is in Australia, Tasmania, and New Guinea.

BIRDS

CLASS : AVES

THE BIRDS

BIRDS are readily distinguished from all other living creatures by the feathery robe which covers their bodies, and which serves the double purpose of clothing and progression.

The skeleton of a bird well repays inspection. The distinctive feature in the skull of either bird or mammal lies in the jaw-bones, which in the former are quite toothless, and at their extremities are developed into horny mandibles that form the beak or bill. The beak varies much in shape in various tribes of birds ; in the birds of prey it is strong, sharp, and hooked, for seizing and tearing living creatures ; in the fishers it is long and pointed, for piercing the prey in the water, and bringing it to the surface ; the boring birds are furnished with a long, straight, and pointed beak, with which to dig into bark in search of grubs and insects ; the nut-cracking birds have a bill, short, strong, and hooked into a sharp point ; the birds which grope in the mud for food are provided with broad, flat, shovel-like bills that are soft and pliable ; and the seed-eating birds have a short, conical, and hard beak, specially adapted for cracking the husks of seeds.

The neck of a bird never possesses less than nine vertebræ, but in many species the neck is longer than the body, and the vertebræ are considerably more in number, the swan, for example, boasting of no less than twenty-three. The vertebræ of the neck are extremely pliable, while those of the back are fused into what is practically one bone ; but the seven or eight vertebræ of the tail are movable, terminating in one bone, which is longer than any of the others. The ribs are fixed to the spine, and are further braced by transverse processes to form a firm and unyielding framework. The flying muscles surpass in volume all the other muscles of the body put together ; and the birds that are capable of great flight possess a ridge or keel on the breast-bone to afford support to the enormous muscles that work the wing. Birds like the eagle, those that possess endurance to cross the sea, and even the tiny humming-bird that spends nearly all its time on the wing, have well-developed keel-bones ; but the breast-bone of the ostrich, which does not fly at all, is almost perfectly flat. ¶

Although the fore-limbs are modified into wings, they are of very similar construction to the arms of a man, except that the wrist-bones are practically abolished. The upper arm-bone, or humerus, and the radius and ulna are there ; and it is not difficult to trace the little projecting thumb, the metatarsal bones of the third and fourth fingers, and even the middle finger itself, although it is much reduced in size and altered in form.

The bones of the legs much resemble those of the mammalian quadrupeds, differing but little except at their extremities. Even where they are of extraordinary length, the thigh-bone is comparatively short, and not visible outside the feathers. Most birds are furnished with four toes on each foot, although there are conspicuous exceptions. The leg exhibits animal mechanism as simple as it is effective. A great tendon, connected with all the toes or claws, passes over the joints in such a manner that when the leg is bent the tendon is shortened, and the claws are drawn together. By this means, the weight of the bird while perched, pressing on the tendon, holds it firmly on the branch, and, consequently, during roosting, the sounder the sleep of the bird, the more securely is it held on its perch. It is partly by the same power that predaceous birds are enabled to fix their talons so forcibly into the bodies of their victims ; an eagle, for example, perches on its prey, sinking down with the whole weight of its body, by which movement the tendon is shortened, and the claws forcibly pressed together.

Birds may be classified according to their feet. The foot of perching birds, such as the sparrow, thrush, and robin, has three long, slender, jointed toes in front, and a short one behind ; the seizers, or birds of prey, possess similar but stronger feet, armed with sharp, hooked talons ; the foot of the climbing birds, such as the parrot and woodpecker, is furnished with two toes before, and two behind ; the scratching birds, of which the common fowl and turkey are typical, have short, thick toes, fitted with stout, blunt claws ; the wading birds, as the crane and heron, are long and slender-legged for walking in the water ; most of the swimming birds, such as ducks and swans, have webbed feet ; and the ostrich has only two short, thick toes, pointing forwards, and providing a sufficiently solid support ; although other running birds possess three stout toes.

Everything in the construction of a bird is subordinated to procuring strength combined with lightness. The body is boat-shaped, sharpening from the middle towards the head in one direction, and towards the tail in the other, or just the design best adapted for cleaving the air. The bones are of lighter make than those of mammals ; some of them, as the upper wing-bone, breast-bone, and part of the skull are hollow throughout their centres, and the remaining bones do not even contain marrow. In addition to lungs there are at least nine air chambers, all connected with

the hollow bones, into which the bird is able to force the hot, rarefied air from its lungs. So complete is this communication that, if a bone be broken, some birds are able to breathe through the open extremity, even though the throat be compressed or the head plunged under water.

The clothing is in strict conformity with the lightness necessary for propulsion through the atmosphere. Feathers form the airiest of dresses, and are all directed from the head towards the tail, so as to present the least resistance to the air. A feather consists of three parts. The quill is that portion which is embedded in the skin; it is cylindrical, hollow, nearly transparent, and eminently light and strong. The shaft, or continuation of the quill to the tip of the feather, is sheathed with tough, glossy, horny material, which protects an elastic substance called the pith. From both sides of the shaft spring the vanes, consisting of expansions, called barbs, arranged with their flat sides towards each other, and forming a point towards the tip of the feather; to the sides of the barbs are attached numerous slender, tapering processes, termed barbules, which are really little hooks holding the barbs together. The vanes form what is called the web of the feather. Where the shaft joins the quill, the barbs are loose, downy in substance, and without hooks, forming what is known as the accessory plume.

Roughly, the feathers of a bird are of three kinds, viz., the clothing feathers, beautifully arranged to overlap each other, so as to form a closely fitting garb; the long quill feathers in the wings and tail, which are used for flight; and next to the skin, soft, fluffy feathers called 'down,' providing an under-jacket to protect its wearer against cold. The circulation of a bird is very rapid, the bodily heat developed by even a small bird being enormous; and the non-conducting feathers retain the warmth, just as the blanket of blubber defends the whale from cold, even when immersed in icy water.

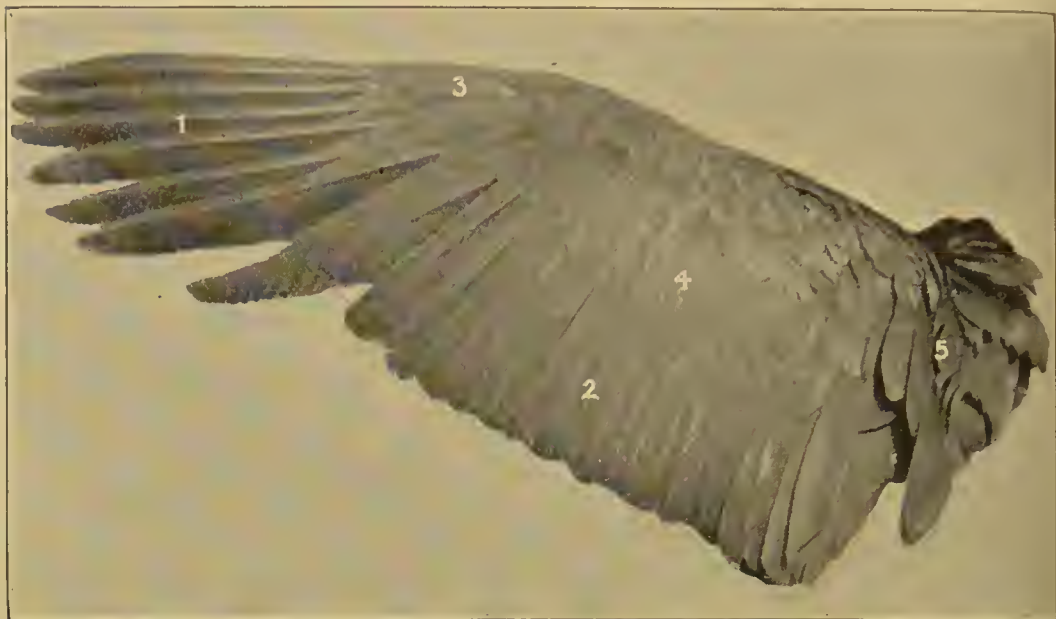
The expanse of the outstretched wings of every flying bird is very great in comparison with the body; and there is need of much muscular development to give the powerful strokes by which the creature is urged through space. Strength, however, is not the sole factor in flight. The wing opens and closes so that on the stroke the flat side of the feathers strike the air, but presenting their sharp edges on the return for another stroke. The oarsman copies this movement in throwing back the blade of his oar on his 'feathering' return in readiness for another forward thrust.

The accompanying illustration of the wing of the condor will enable us to understand at a glance the principal kinds of feathers that make up its covering.

The quill feathers of the tail are called 'rectrices,' or guiders, being used to assist the bird in steering its course; extending over

part of the tail above are the upper tail coverts, while the lower tail coverts act similarly on the under side.

In the fur-clad mammals ragged hairs are shed in the autumn, giving place to a new coat in preparation for the cold season.



1. Primaries. 2. Secondaries. 3. Major coverts of Primaries. 4. Major coverts of Secondaries. 5. Scapulars.

Correspondingly, birds 'moult' their feathers, thus obtaining a new set of plumes to replace those which have deteriorated by wear and tear. Most birds generally moult immediately after the breeding season, but very often there are two moults during the year, and in some cases there are three. A broken or damaged feather, however, may be replaced at any season. If the injured feather be drawn from its socket, another one will speedily take its place. A bird that accidentally loses even a long tail, in only the course of a few days may show the tips of new feathers already extending beyond the tail coverts, and in a month or so will have regained its complete adornment. The showiest feathers are usually worn by the male birds, and not infrequently the sexes are so markedly unlike as to cause doubts concerning their relationship. In later pages, when birds are described in detail, the particulars of the plumage will generally refer to the male bird.

The sight of birds shows remarkable telescopic adaptability for near or distant objects. The swallow, when darting swiftly through the air, must be able to accommodate its sight to the tiniest of insects within the short space occupied by its swoop. A bird of prey, even when at a great altitude, can not only perceive a small bird or quadruped far beneath it; but in its lightning descent,

it calculates the distance so precisely as to snatch up its prey, while avoiding what would seem to be inevitable forcible contact with the ground. It is quite evident that the focus of the eye must undergo radical change between the points when the prey is first sighted and when it is struck.

Though birds are vertebrate animals, possessing a four-chambered heart, and breathing atmospheric air, they are oviparous, that is, they produce their young from eggs, which have to be warmed into independent life by the application of constant warmth, that in most cases is afforded by the close brooding of the mother bird. Artificial heat, however, is equally effective, and is largely employed in the hatching of young poultry.

It is wonderful to see how a living creature is gradually evolved from the apparently lifeless substances which are contained within the hard calcareous shell. The 'white' and 'yolk' require no description, but it is upon the latter that lies the little germ which, in the case of the common fowl, within the space of three weeks, will be developed into a bird; though in other species of birds the time of hatching varies from ten days to about as many weeks.

After only a few hours' warmth, the first idea of the chick appears as a whitish streak, barely one-tenth of an inch long. This streak enlarges, and forms two little ridges between which a delicate thread makes its appearance, and is the first indication of the spinal cord; and this is quickly followed by the most minute, square, white plates, which are the commencement of the vertebræ. The little heart is just perceptible on the second day, and on the third a series of blood-vessels are formed. The various organs of the body are gradually built up, the feathers appearing on the twelfth day; on the nineteenth or twentieth the chick pierces with its beak the air-sac, which lies at the blunt end of the egg; and by means of the air thus obtained it is able to chirp before it chips its way out of the shell.

The voices of feathered creatures are more varied than those of the mammals; and in many cases the volume of sound is altogether out of proportion to the size of the bird. A bird's windpipe generally consists of rings of cartilage, forming at the point of its bifurcation the lower or inferior larynx, which comprises a glottis and an arrangement of muscles far more important than the more simply constructed superior larynx. The form and movements of the apparatus permit remarkable modifications of the tones; and the provision of the air-cells, in addition to the lungs, contributes to the volume of sound. All bird cries, the outcome of various motions, are more or less intelligible; but it is the melodious song of the males of many species that appeals to the human understanding, adding to the joy of life, and bringing charm and soothing even to the broken-hearted.

No phase of animal life is more interesting than that of the

migration of birds, many of which move to and fro enormous distances according to the season. Various mammals promptly hibernate when cold weather cuts off their supply of natural food, whereas birds simply travel to another region in search of it. In the northern hemisphere migration towards the north is always for the purpose of finding the most suitable temperature for breeding; movement southwards is always prompted by the desire for food and warmth. About four hundred different species usually figure in the lists of recognised British birds; but only a hundred and forty-one of them remain with us all the year round; and to these we may add forty that are summer visitors only, thus giving about a hundred and eighty species that nest in this country.

Some birds, as the cuckoo, swallow, and nightingale, are summer visitors only; the fieldfare, wild ducks and geese are winter visitors; and some, such as the sand-piper, are mere birds of passage, only paying us a call while on their way to other regions. Spring and autumn are the periods when the tide of migration flows strongest. But even with the birds that propose staying the winter with us, a fall of snow in the north, or a severe frost in the Midlands, will at once cause a general rush of birds towards the southern counties. This subject will be amplified in later pages in connection with various selected birds, together with many other points of interest that one cannot dwell upon in a very brief review of the more or less common characteristics of the Birds.

There are at least ten thousand species of birds, but ornithologists differ considerably regarding classification, and some authorities place the number at thirteen thousand. They are marked by far greater uniformity of structure than is the case with the Mammalia; and it is this very similarity that provides the stumbling-blocks concerning what shall be the deciding feature of any species. The following classification is one that is fairly easy to understand, while it meets with the approval of the majority of naturalists.

CLASS: AVES

ORDERS OF BIRDS

1. Passeres	.	.	.	Perching Birds
2. Picariæ	.	.	.	Woodpeckers and their Allies
3. Psittaci	.	.	.	Parrots
4. Striges	.	.	.	Owls
5. Accipitres	.	.	.	The Diurnal Birds of Prey
6. Steganopodes	.	.	.	The Cormorant Group
7. Odontoglossi	.	.	.	Flamingoes
8. Herodiones	.	.	.	Herons and storks
9. Anseres	.	.	.	The Duck Tribe
10. Palamedeæ	.	.	.	The Screamers

11. Columbæ . . .	Pigeons
12. Gallinæ . . .	Fowls and game-birds
13. Fulicariæ . . .	Rails and coots
14. Alectorides . . .	Bustards and cranes
15. Limicolæ . . .	The Plover Tribe
16. Gaviæ . . .	The Gulls
17. Tubinares . . .	Albatrosses and petrels
18. Pygopodes . . .	Diving Birds
19. Impennes . . .	Penguins
20. Ratitæ . . .	The Flightless Birds

The last-named order forms a sub-class, the special characteristic of which is the absence of a breast-bone keel which naturally accompanies the inability to fly; the remaining orders form the sub-class Carinatae, in which most of its members possess a marked keel-bone and varying powers of flight. Within the limited space at our disposal it is manifestly impossible to deal at length with so vast an assemblage as the birds, the orders alone being double those of the mammals; but their great structural uniformity, and some marked similarity in many general habits, will enable us to gain a fair knowledge of the Class Aves, within a briefer compass than was demanded by the Mammalia.

ORDER : PASSERES

THE PERCHING BIRDS

This order, which comprises nearly six thousand species of birds, principally of small size, is not very happily named, because other birds are in the habit of perching. Nevertheless, the feet of the Passerines are specially adapted for perching, three toes being directed forwards and one backwards. It is the construction of the palate and the manner in which certain tendons of the foot are arranged that form the chief characteristics of the order, although there are other minor anatomical considerations, altogether too technical for a work of the present nature.

The Passeres are divided into two sections: the *Acromyodi*, or Singing-Birds; and the *Mesomyodi*, or Songless Passeres. Here again the distinction concerns the anatomical structure of the lower larynx rather than the melodious qualities of the notes produced; for example, the Crows are included among the Singing-Birds, and they are certainly less musical than some of the Mesomyodeans. However, all our song-birds belong to the Acromyodian group, in which there are over forty tolerably well-marked families.

FAMILY : TURDIDÆ

THE THRUSHES

Representatives of this family are distributed over the whole world ; they comprise quite a number of familiar species, of which not a few are capital songsters and favourite cage-birds. Their food consists chiefly of insects and worms, but some of them have a marked liking for fruit. Of the eight sub-families we shall omit five, which concern Indian, Indo-Chinese, American, and Australian birds. In the *Turdinæ* are the thrush, blackbird, redwing, and fieldfare ; to the *Ruticillinæ* belong the redstarts, robin, and night-ingale ; and in the *Saxicolinæ* are the chats and wheatears.

THE SONG THRUSH (*Turdus musicus*)

The Song Thrush, Throstle, or Mavis, is common in the British Isles throughout the year, for though in autumn some of our native birds migrate, their places are taken by others from the Continent. The male bird is a mixture of dark and golden brown on the upper parts ; buffy white, spotted with brown, underneath. It is a deservedly popular songster, its rich, mellow, flute-like notes being heard even in November and December, when most of our other native singing-birds are silent. While its song is well-sustained and remarkable for the purity of its intonation, it is mingled with notes borrowed from other songsters, giving rise to such variations that cause one to doubt whether the song is proceeding from one bird.

The Thrush feeds chiefly upon snails, worms, slugs, etc., but it is fond of fruit, especially cherries and strawberries, which to some extent discounts its marked usefulness, though its depredations are really slight compared to its continual destruction of garden pests.

The nest of the Thrush, composed of roots and mosses, is lined with mud, cowdung, and decayed wood. So well-kneaded is the compost that the nest will hold water almost as well as an earthenware vessel, and it serves well to protect the callow young from the chilly blasts. It is built almost before any other bird has commenced ; it is generally placed among ivy or in a thick bush, but until the leaves appear it is rather a conspicuous object. Two or three broods are, as a rule, reared in a season. The eggs are blue, spotted with black or purplish brown, chiefly at the larger end.

THE MISSEL THRUSH (*Turdus viscivorus*)

The Missel (or Mistle) Thrush is the largest and handsomest of the species. It is very partial to yew, holly, rowan, and especially mistletoe berries, hence its name ; but it is also called the Storm Cock, because its loud, clear tones are often flung from a tall branch when the wintry blast is howling through the naked trees. Unlike

the Song Thrush, which only congregates when about to migrate, the Mistle Thrushes range the countryside in great flocks in autumn, at which period they are liable to work no inconsiderable damage to orchards. The Storm Cock's nest is large, weighty, and less tidy than its cousin's, consisting of moss and bents lined with grass, and fixed on a foundation of mud. The four or five eggs are often laid as early as February; they are greenish or reddish white, blotched with brownish red and lilac.

THE BLACKBIRD (*Turdus merula*)

The Blackbird, common everywhere in the British Isles, is uniformly black in colour, only relieved in the male bird by its orange-tawny bill. In its food and habits it much resembles the thrush, but surpasses it in its love for fruit. Large numbers of Blackbirds are destroyed annually by mortified fruit-growers, who



BLACKBIRD

are apt to forget that during a great part of the year each bird requires several hundreds of garden pests a day to satisfy its appetite.

The Blackbird's song is a full, melodious, joyful carol, but broken by noisy tones that somewhat militate against its use as a cage-bird. It is shy and suspicious, and if alarmed darts through a hedge uttering a sharp cry, part cluck, part screech. The frantic larum is well known to other wild creatures, as can be testified by many sportsmen, whose prospective quarry has recognised anger, and effected its escape at a critical moment.

The Merle, as the bird is sometimes called, is very courageous in defence of its nest, and a couple of birds have been known to attack a cat which they suspected of designs upon their young. The nest is generally built in the centre of a thick hedge or bush, preferably a spreading holly. It is a large but tidily constructed habitation of grass stems and moss, surrounding a cup of dried mud, which is lined with fine grass. The eggs, even in the same nest, are extremely variable in colouring, but usually they are greenish blue, spotted and speckled with reddish brown, although sometimes markings are entirely absent.

The Blackbird is sometimes called the Black Ouzel, on account of its resemblance to the Ring Ouzel (*Turdus torquatus*). The latter, however, is more elegantly shaped, and wears a white gorget on its breast. In summer its habitat is the mountainous regions of Central and Northern Europe, and in our country favours Scotland and Derbyshire; in autumn the great majority of the species migrate to Northern Africa, but considerable numbers remain to winter in Britain.

THE FIELDFARE (*Turdus pilaris*)

In appearance the Fieldfare suggests a small missel thrush with a bluish tint on its upper parts. It is a native of the cold regions of Europe, and only visits this country during the winter months, arriving in October and November. If our winter prove severe, the Fieldfare betakes itself still further south, paying us a flying visit in the spring, when it is on its way back to its northern breeding quarters. It builds its nest chiefly in fir or pine trees; the bluish-green eggs are spotted with brown.

Eminently gregarious, the migrant Fieldfares not only arrive in our country and depart from it in immense flocks, but during their stay they consort in large parties. When they reach our shores they are in rather poor condition, but by December they are plump, and are considered an excellent adjunct to the table. They are caught in great numbers in the neighbourhood of watercourses and damp meadows. The main body of the birds returns to the north in April and May, though some of them remain until June, on the friendliest terms with the blackbirds and thrushes; and instances are recorded of the Fieldfare remaining to breed in this country.

THE REDWING (*Turdus iliacus*)

The smallest of the Thrushes, the Redwing, is easily distinguished when it spreads its wings for flight, the action disclosing a large patch of orange-red feathers on its sides. It is called the Nightingale of Norway, where it largely makes its home, although it extends as far north as Iceland; but during the bird's residence in Britain we do not hear its song. Its voice ranges from the fullest, richest



PLATE XV

Sedge Warbler
 Lesser Whitethroat
 Song Thrush

Whinchat

Redbreast
 Goldfinch
 Blue Tit
 Dipper

strains to an undertone that can only be heard at a short distance. The Redwing usually reaches us about October, but those birds that select the other side of the Channel are in time to fatten upon the grapes, after which the French consider its flesh to be not inferior to quail and woodcock. It is, however, less a fruit eater than most of its tribe. In severe weather, when its beak cannot pierce the hard ground in search of worms, insects, etc., the Redwing is one of the earliest birds to die of starvation.

THE REDSTART (*Ruticilla phænicura*)

The Common Redstart, or Firetail, is a graceful summer migrant from Northern Africa to Central and Northern Europe. It is a conspicuously coloured bird ; the head and upper part of the back are bluish grey ; the tail and tail-coverts a bright rusty red, and the white forehead is thrown into prominence by the deep black of the throat. It gains

its name from its dominant colour, and the peculiar character of its flight. It will suddenly flash out of the leafage, flirt its tail to display a ruddy gleam, and after proceeding but a few yards, will turn into the hedge afresh ; this manœuvre it will repeat again and again, finally doubling back and returning to the spot from which it was started. The song of the Redstart, though not powerful, is peculiarly sweet ;

it sings only during the two months of the breeding season, when it often indulges in music far into the night. Arriving in this country at the end of April the bird commences building its nest, which usually is placed in a hole in a wall or hollow of a tree ; the eggs are blue with a tinge of green.



REDSTART

The Black Redstart (*R. titys*) is one of our winter visitors, chiefly to Cornwall and Devon, but never in great numbers. It is darker on the body and wings and redder on the tail than its foregoing relation. It never stays to nest in Britain.

THE REDBREAST (*Erithacus rubecula*)

The Redbreast, or Robin, is a general favourite on account of its fearlessness, and perhaps equally because it figures largely in tradition. The story of the Babes in the Wood is popular in the nurseries of many nations; and a Breton legend attributes the bird's red breast to injuries it sustained while engaged in plucking thorns from our Saviour's brow when on the cross. In any case, even the marauding schoolboy will stay his usually ruthless hand when he discovers the nest of the Robin, in the full assurance that ill-luck will dog the despoiler. The nest, composed of dead leaves and moss, lined with hair and feathers, is generally placed in a hole in a bank, crevice in a wall, or amongst ivy; but frequently the bird selects most unexpected spots, such as the spout of a pump, a tree-pot, or an old tin can. The five to seven eggs are yellowish white, spotted with light red.

The song of the Redbreast is varied and pleasing, but it gains much of its charm from the fact that a sunny day, even when the snow is on the ground, will excite a sweet but broken melody. The songster appears to be quite a ventriloquist. Sometimes the beak is kept closed, only the ruffling of the feathers of the throat showing that the Robin is singing, yet the sound appears to come from another bird at a distance.

It is wonderful to see what large worms and insects a Robin will devour. It will toss an extra long and thick worm about with its beak, fling it over its head, bang it on the ground, jump upon it, and only commence to devour it piecemeal when it has been smashed into a pulp. When the berries are gone, and insects and worms are unprocurable from the hard ground, the Robin flies to the habitations of men for shelter and food. It speedily becomes quite bold, and will tap at a window if the expected crumbs are not forthcoming; in the spring, too, it will attend the gardener, snatching up worms as the spade unearths them. Innumerable anecdotes could be told of the bird's friendliness often amounting to audacity. Quite recently one flitted about the aisle of one of our cathedrals during morning prayers, joining occasionally in the service with a modest twitter. When the clergyman ascended the pulpit, and commenced the sermon, the Redbreast perched himself on a pinnacle of the chancel-screen and sang his loudest, almost drowning the words of the preacher.

When the Pilgrim Fathers landed in New England they gave the name 'robin' to one of the American thrushes (*Turdus migratorius*) because of its red breast, and its friendly attitude towards

man, though really it is related to our blackbird, and has a most melodious song. The American Robin has been introduced into Surrey with marked success; six pairs of birds, set free near Guildford, reared about forty nestlings in their first year.

THE NIGHTINGALE (*Daulias lusciniæ*)

The Nightingale is garbed chiefly in russet-brown above and buffish white below, with the tail a bright rusty red. It visits us in April, confining itself largely to the south-eastern and midland



NIGHTINGALE

counties, which is a matter of deep regret to bird-lovers in other parts of the kingdom, for this Mendelssohn among birds is welcomed everywhere for its exquisite melody. Wales, Scotland, and Ireland are seldom favoured with its presence, although the bird is found in Portugal, which is more westerly than Ireland, and in Sweden, more northerly than Scotland. Devon and Cornwall are strangely avoided by the Nightingale, where one would suppose it would find congenial environment. Gilbert White suggested that the visitor avoids a longer sea voyage than is absolutely necessary, and crosses only at the narrowest points of the Channel; and certainly birds that arrive only at Brighton are often so exhausted that they are glad to seek shelter under the bathing-vans.

The song of the Nightingale is an amazing mixture of joy and melancholy ; at some points its note is a piteous wail, one of the saddest sounds in Nature, but passing by rapid transition into a cataract of gladness. The male birds arrive on our shores a few days before the females, and it is during this interval and the time of pairing that the male vents his most delicious notes, as if a mate were won by vocal excellence. Milton was probably unaware that, as with other singing birds, it is the male that is the musician, or he would not have addressed the 'sweet songstress' ; and for the same reason 'Philomela' and 'Queen of the Night' are misnomers. From the time of its arrival to the hatching of the young the Nightingale sings all through the day, when it often passes unnoticed amid the general melody of other feathered minstrels. In the evening it ceases its lay earlier than the thrush, only to resume it as late as ten or eleven o'clock, at which time it occupies Nature's operatic stage almost entirely alone, and can be heard to fullest advantage. Bird-fanciers seek to obtain cage-birds before the Nightingales have paired, for an unmated bird will take to confinement, whereas later, it will pine to death. A bird has lived in captivity for more than twenty years, and one sang for over a hundred days in succession.

In some parts of the British Isles, which the songster neglects, attempts have been made to secure its favour. Nightingales' eggs have been introduced and hatched in the nests of other birds, but in no case have the young birds returned to their birthplace in the following year. Even if they consented to fall in with the plan, the result would probably be disappointing ; for it is an established fact that a young skylark, hatched in a finch's nest, adopts the notes of its foster-mother, and the young nightingale would doubtless follow suit.

The Nightingale's nest is made of grass, leaves, and a few hairs ; it is generally hidden beneath heavy foliage very near the ground. The eggs are olive-brown in colour, and quite unlike those of any other British bird of the same size.

Fortunately the Nightingale does not figure largely in the list of small edible birds ; and certainly no present-day gourmand would provide a dish of Nightingale's tongues for his guests at a cost of £7,000, such as Pliny attributes to Clodius Æsopus. Numerous small songsters, however, especially on the Continent, are caught in thousands for table use, swallows, thrushes, larks, and even robins falling to the professional snarers, who keep the markets supplied. In our country larks, buntings, and wheatears are captured in large numbers, and are regularly exhibited for sale in our poulterers' shops ; starling and sparrow-pie is somewhat esteemed ; but in no London restaurant could one obtain a dish of fried canaries as in the cafés of Madeira.

THE CHATS

Of the true Chats the best-known are the Whinchat (*Pratincola rubetra*) and the Stonechat (*P. rubicola*). They are of rather small size, and possess an elongated hind toe, that marks them as terrestrial rather than arboreal birds.

The Whinchat is mainly brown above with dashes of blackish brown ; the underparts are yellowish white ; the neck and breast are reddish yellow ; there is a white streak over the eye, and a white spot on the wing, and at the base of the tail. It comes to us in May and June, and leaves in autumn, although a few specimens sometimes remain for the winter. It frequents commons and heaths, and is often called the Furzechat. It is a restless bird, constantly flirting its tail ; and whether at rest or on the wing, it sings its simple song, that is somewhat similar to the efforts of the red-start.

The Stonechat is a darker bird, especially on the head and neck, where it is black ; and it lacks the white eye-streak of its cousin. Its song is seldom heard, for any attempt to get near it puts the bird in too great a flutter concerning the safety of its nest for it to devote any attention to music. It invariably builds in a furze-bush on the ground ; the eggs are pale blue with reddish-brown specks. Another popular name for this bird is Stoneclink, because its note of alarm reminds one of two pebbles clicked together. Unlike the foregoing bird, the Stonechat totally deserts us during the winter.

THE WHEATEAR (*Saxicola ænanthe*)

The Wheatear is one of our earliest visitors, arriving on our shores as early as the middle of March. For some weeks it remains near the coasts, feeding chiefly upon marine insects, while the land insects are still safe in their winter quarters. Later, the shy bird with its dipping flight betakes itself to the commons and waste lands throughout the country. It is rather a conspicuous bird. Its head and neck are bluish grey ; wings, dusky brown ; neck and breast, yellowish red ; a very distinctive black mark entirely surrounds the eye ; and an equally noticeable patch of white adorns the base of the tail. It is a pretty but not a powerful songster. The nest of grass, moss, and leaves, lined with hair or wool, is built on the ground, often in a deserted rabbit-burrow or hole under a rock ; the eggs are particularly smooth, and in colour are a delicate bluish green. In the autumn the bird is very fat preparatory to a long journey southwards, at which time it is caught in vast numbers. Its flesh is so delicate that it is called the English ortolan.

FAMILY : SYLVIIDÆ

THE WARBLERS

Some authorities include the redstarts, robin, and nightingale with this family, and there is no doubt that they approach very closely to the true Warblers, which are usually small-sized, plainly garbed, and possessing slender bills in consonance with their more insectivorous tastes than the thrushes. Most of them gladden our country with their pleasant songs. Many of the birds of the foregoing family, when young, differ considerably from their parents in the colour of their plumage ; but the immature Warblers rather closely resemble the adults. Though the birds of this family are widely distributed throughout the temperate regions, the species in the Eastern Hemisphere far outnumber those in the New World. Most of them are of migratory habit, and are capable of very protracted flight. Quite a dozen Warblers are regular summer visitors to the British Isles, and many others reach us by accident rather than of set purpose.

THE BLACKCAP (*Sylvia atricapilla*)

The Blackcap is mainly grey with a tinge of olive on the upper parts, and greyish white underneath ; the top of the head of the male is black, which is replaced by chocolate colour in the female.



BLACKCAP

The song of this dainty little bird is entirely captivating, containing no note of melancholy, but an unrestrained gladness, that in some respects is superior to the harmony of the nightingale. It does not arrive until the end of April, but sings late into the summer, by which time Philomel's best note is only a croak. For food the Blackcap relies chiefly upon aphides and caterpillars, especially

those that infest fruit trees, and for its usefulness in that respect may be forgiven for purloining a few ripe raspberries.

The nest is lined with fine roots and hair, often bound together with spiders' webs ; it is a frail, neat structure, which is generally placed in low thickets and close shrubberies. The four to six eggs vary considerably in colour ; often they are a dirty white, with blotches and streaks of dark brown ; sometimes they are pinkish in ground colour, mottled and speckled with light and dark purple. The male bird often assists his mate in the incubation of the eggs ; but his assistance sometimes proves of doubtful utility, since he is given to tuning up to relieve the tediousness of his task, which to some extent discounts the care with which the nest has been concealed.

THE WHITETHROATS

The Common, or Greater, Whitethroat (*S. cinerea*) is chiefly rusty grey in colour, deriving its name from the white throat and abdomen ; but if one fail to recognise it by its colouring, its curious habit of flying upwards from its perch to descend upon the same spot will unfailingly secure its identification. It is a frequenter of the hedgerow, venting a rather pleasing song during its restless movements and short flights, after which it almost always returns to the same twig. The name 'nettle creeper' denotes the bird's habit of creeping about the lower parts of hedges. Not infrequently the Whitethroat sings at night in May and June, especially when disturbed, whereas under similar circumstances most birds will steal quietly away. On the whole the bird is an insect eater ; but with its young brood it frequents gardens, and does much mischief among raspberries and currants. The small nest with its greenish-white eggs, thickly spotted with brown, is generally built among brambles.

The Lesser Whitethroat (*S. corruca*) is a slightly smaller bird, clothed in grey and brown above, and almost pure white below. It is often called the Brake Nightingale and 'Jackstraw,' which latter name is also applied to the preceding bird. Its food is chiefly caterpillars and countless aphides, for which the gardener owes it a debt of gratitude, notwithstanding its liking for soft fruits. The nest is rather deep, and spiders' webs are often mingled with the lining of hair.

THE HEDGE SPARROW (*Accentor modularis*)

The Hedge Sparrow, or Hedge Accentor, is often referred to a separate sub-family of the Turdidæ ; but in any case it has no relationship to the hard-billed, grain-eating, true sparrows. It is one of our commonest British birds, frequenting gardens, copses, and hedgerows, where it sings a pleasing, if plaintive, melody. In colour its back and wings are reddish brown, streaked with darker brown ; the underparts are buffy white ; its neck, throat,

and breast are chiefly bluish grey ; and its crown is ash colour. Remaining with us all through the winter, the Hedge Sparrow builds its nest as early as March. It is prettily constructed of dry grass, moss, hair, and wool, in which are deposited bright blue eggs. When sitting, the hen bird is often quite bold, not attempting to stir even when the boughs are parted, but nevertheless watching every movement of the intruder.

MISCELLANEOUS WARBLERS

The Garden Warbler (*Sylvia hortensis*), often called the Greater Pettichaps, is olive-green in colour shot with grey above ; the breast and sides are grey ; the throat and remainder of the underparts are white. It is one of the sweetest of our songsters, and is to be found almost everywhere up and down the country, where there are thick woods and plenty of water. The nest and eggs are very similar to those of the blackcap, and they are often mistaken for one another.

The Dartford Warbler (*S. undata*) is not much larger than a wren, and in its habits reminds one of the chats ; it commonly frequents furze and heather, but rarely extends beyond the valley of the Thames. It sings its quavering song while hovering over bushes, erecting its crest and tail in accompaniment. The approach of a human being promptly causes it to skulk in a bush ; and its nest of grass, moss, and wool, placed in the thickest furze, is always difficult to find. The eggs are greenish white, speckled all over with olive and reddish brown.

The Chiff-chaff (*Phylloscopus rufus*), so called from its peculiar and never-ceasing cry, is one of the first of our Warbler visitors in spring, and one of the last to leave us in autumn, sometimes delaying its departure until the middle of October. It is also called the Lesser Pettichaps, and the Chip-chop. The feathers on the upper parts are chiefly olive-green dashed with yellow ; the under parts are yellowish white, and there is a streak of the same colour over the eye. Insects and their larvæ form the bird's principal food, and upon its first arrival it pays special attention to leaf-rolling caterpillars. The nest, generally low down in a bank, is partly domed, and consists of leaves, grass, and moss, with a lining of feathers ; the eggs are white, with dark purple spots.

The Wood Warbler (*P. sibilatrix*), or Wood Wren, is easily mistaken for the Willow Warbler or Chiff-chaff, for there is little or no difference in their size, colour, or habits. It arrives in England in the latter part of April, and what Gilbert White described as its " joyous, easy, and laughing " song is soon heard from the tops of trees in woodland districts. The conclusion of its sweet strain is always tremulous, caused by the quivering of the wings and tail with which the bird brings its lay to an end. The bird builds its domed nest of

grass, ferns, and moss, with a lining of hair, in thick herbage, and often against the stump of a tree. The eggs are white, and very thickly spotted with purple-brown.



WOOD WARBLER

The Willow Warbler (*P. trochilus*) is common in the British Isles from about the end of March to the beginning of October. It is delicately coloured in olive green with a yellowish tinge above ; underparts almost pure white ; and above the eye is a distinctive yellow streak. It is also called the Willow Wren, although it has no marked partiality for the willow tree ; other names are Peggy Whitethroat and Hay-bird, this latter on account of its fondness for mowing fields, and because its nest, in a bank or bottom of a bush, is largely composed of hay ; it is a dome-shaped habitation, entered by a little hole in the side. The eggs, often seven in number, are white, speckled with light red. The song of the bird is a delicious little warble, much resembling that of the robin, except that there is an added note of cheerfulness.

The Reed Warbler (*Acrocephalus streperus*) spends from April to September with us ; it rarely extends north of Yorkshire, and visits neither Scotland nor Ireland. Its dress is chiefly reddish brown above and yellowish white beneath. Evening twilight is the time that the bird devotes to its loudest musical exercises. It frequents river reed beds, building a compact nest of dry grass, lined with wool and hair, which it suspends from reeds that are woven into the sides of the structure. In windy weather, when the reeds are blown nearly to the surface of the water, the birds, both old and young, hold to the sides of the nest with their claws, and "thus ride as securely in their cradle as a sailor does in his cot or

hammock." The eggs are greenish white, speckled with dark olive and ash.

The Sedge Warbler (*A. phragmitis*) is a much commoner bird than the last named, and its haunts and habits are very similar. Some naturalists assert that it always builds its nest in low bushes, but others emphatically maintain that it also suspends it from reeds. The eggs are yellowish brown, often streaked with fine black lines. The bird is greyish brown above, and yellowish white, tinged with red, beneath; the throat is white, and a yellowish white stripe surmounts the eyes. Its song is hurried, and is not particularly strong or sweet; its chief interest lies in the notes of other birds, which it repeats in identical time and key.

There are many brilliantly coloured foreign Warblers that might be mentioned, but none more interesting than the sober-garbed Tailor Bird (*Sutoria*) of India and the East Indian Archipelago. Its nest is an ingenious retreat that must be seen to be believed. The bird takes a couple of growing leaves, brings their edges together, and literally sews them with a thread of vegetable fibre, using its bill as a needle; sometimes one large leaf is sufficient for the purpose. In the deep, inverted hollow cone thus produced, vegetable down and feathers are placed, in a hollow of which the eggs are laid and the young birds reared. This unique habitation is suspended at the very extremity of a branch, too slender to support the weight of monkeys or serpents, that are ever on the look out for eggs and young, or the mother bird herself.

FAMILY: FRINGILLIDÆ

THE FINCHES

One of the largest families of song-birds, the Fringillidæ comprises about six hundred species of nearly world-wide distribution. They are small birds, and not a few of them are very prettily garbed. Many of them are gifted with loud, clear, and melodious songs, and fill our wooded districts with delightful harmony. Only a few of our native Finches are migratory, but in winter they are reinforced by vast numbers from the colder regions. In spring and summer the chief food of the family is insects and their larvæ, but a taste for buds, leaves and flowers causes some of them to be little loved by the gardener; nevertheless, the majority can claim to do more good than harm, for they feed their young almost entirely on caterpillars and other insects. In the colder portions of the year the Finches feed principally on harmful weed seeds, for which purpose their stout conical bills are particularly suited. Short descriptions of a dozen selected birds must perforce serve for the whole vast assemblage, which is divided into three sub-families: the *Coccothraustinæ* or Grosbeaks; the *Fringillinæ* or true Finches; and the *Emberizinaæ* or Buntings.

THE GROSBEAKS

The chief characteristic of this group is the stout beak with a marked depth of the lower mandible. A large number of the Grosbeaks are natives of tropical America, of which the Red Cardinal (*Cardinalis virginianus*) is a brilliant example. The male is scarlet-vermilion above, while the forehead, chin, and throat are black; the wings are dusky, and the underparts a rich vermilion. On account of its mellow, rolling, whistling notes it is often called the Virginian nightingale. In garb and voice this bird far excels our British members of the sub-family.

The Greenfinch (*Ligurinus chloris*) is often called the Green Grosbeak, but more frequently the Green Linnet. It is olive-yellow washed with ashy grey on the upper parts, and yellow on the lower; but there are continental varieties, yellow, black, white, and cinnamon in colour.

In our country the Greenfinch frequents gardens, shrubberies, and cultivated lands, feeding upon insects and seeds. In autumn, when large flocks range the countryside, the food consists largely of seeds that would otherwise cause the farmer endless trouble in the spring. The song of the wild bird is too plaintive and monotonous to be particularly pleasing, but in captivity its strains are capable of great improvement. The wild bird frequently mates with the linnet or the goldfinch; and the cage-bird pairs with the canary. The nest



GREENFINCH

is not very neat, and is generally placed in hedges and shrubs; very often it is built so close to water that young birds, falling out of the nest, are drowned. The eggs are bluish white, spotted with grey and reddish brown.

The Hawfinch (*Coccothraustes vulgaris*) is the Common, or Black-throated, Grosbeak. It is rare in Scotland and Ireland, but appears to breed in almost all parts of England, except Cornwall. It is, however, so shy and retiring that it is not known so well as many really scarcer birds, although it remains with us all the year round. Its plumage is dark reddish brown on the back and lighter on the crown and cheeks; the black wings are marked with white, and the underparts are purplish red. In some districts the bird is called the 'Berry-breaker'; its strong beak is capable of cracking the kernel of a cherry; and in autumn when the young Hawfinches pay visits to kitchen-gardens, they open pea-pods with the greatest ease.

THE TRUE FINCHES

THE CHAFFINCH (*Fringilla cœlebs*)

The Chaffinch is one of our commonest hedgebirds. It is decidedly pretty in colouring; its back is chestnut; forehead, black; crown and nape, greyish blue; breast, wine-red; wings, black with white



CHAFFINCH

bands; tail, black with the two middle feathers ashy grey; and here and there are tinges of green and yellow. The bird's specific title of Cœlebs denotes a bachelor, because in the late autumn the females congregate and depart for other regions, leaving the males to spend the winter in sociable communities of their own.

The call-note of the Chaffinch, or Pie-finch, as it is also named, is a musical 'pink-pink.' Its full song is lively and engaging, and in some parts of the Continent it is a great favourite with

fanciers; bird philharmonic societies organise singing contests, and prize birds realise remarkable prices; but it is asserted that the song of the wild English Chaffinch surpasses that of the finest cage-birds.

The nest of green moss, wool, hair, and feathers, laced with

spiders' webs, and the whole felted together, is a dainty example of bird architecture. When placed in the fork of the lower branches of a tree, or in a bush, its protective coloration prevents its discovery by any but a practised observer. The eggs are purplish grey, dashed with green, and streaked and spotted with purplish brown.

THE GOLDFINCH (*Carduelis elegans*)

The Goldfinch, or Thistle-finch, is one of our most beautiful songsters, to whose brilliant complicated garb words can do but scant justice. The front of the head and throat are blood-red ; the head and nape are black, in marked contrast to the white cheeks ; the back is dusky brown, darkening into black on the tail, which is tipped with white ; and the wings are variegated with white, black, and yellow. There are few prettier sights than a 'Goldspink' fluttering along a hedge, perching upon thistle-tops, plucking out the down, and biting off the seeds, and anon darting after the floating seeds of the dandelion and groundsel. It will run up the stem of a thistle, or burdock, and peck away, quite careless of the attitude it has to adopt to reach its food. The nest of the Goldfinch is neatly and compactly made of moss, lined with down, feathers, and hair, and harmonising beautifully with its surroundings. The eggs are greenish white, speckled and streaked with purplish brown.

The Goldfinch, with its delicate and harmonious notes, makes a most intelligent and docile pet. It is capable of learning all kinds of tricks, such as hauling up its water supply in a little bucket, perching on the finger and whistling, and firing a tiny cannon with perfect steadiness and without alarm.

THE LINNET (*Linota cannabina*)

Except in the north of Scotland the Linnet is common throughout Great Britain and Ireland. It is chiefly brownish grey with dashes of crimson on the forehead, crown and breast ; many of the wing feathers are tinged with red and tipped with ashy grey ; the black tail feathers have white edges ; and the abdomen is white. In winter the red of the head and breast changes to simple brown, which accounts for the bird also being called the Brown Linnet ; but in the intermediate stages of



LINNET

change the plumage varies considerably, and hence the bird is spoken of as the Grey, Rose, or Red Linnet, often in the belief that they are at least different varieties. The Linnet is particularly fond of hemp and linseed, from which latter it probably gains its name.

The Linnet frequents commons and neglected pastures, where it sings the remarkably sweet, though not powerful strains, which make it a popular cage-bird. At the end of the breeding season the birds form large flocks, generally consisting of separate sexes; and though vast numbers of our home-bred birds betake themselves to other lands, many remain and mingle with greenfinches in search of food, which consists largely of weed seeds. In the spring insects form a large part of the daily menu, so that the usefulness of the Linnet more than counterbalances the occasional raiding of newly planted ground or standing corn. The nest is usually built near to the ground, a furze bush being a favourite location; the eggs are bluish white, spotted with dark brown and faint purple.

THE HOUSE SPARROW (*Passer domesticus*)

The House Sparrow is too well known to call for description. In towns it is a harmless and generally pleasant companion, its courage and impudence offering us endless amusement; but in the country, on account of its numbers, it is a serious pest, working infinite mischief almost all the year round. It ravages the seed drills, and plays havoc with the tender shoots of young plants, as the irritated suburban gardener can testify; but on the other hand, it can claim credit for the destruction of vast numbers of caterpillars, and other insect pests. In the country it is responsible for serious depredations in the cornfields; and in autumn large number of town sparrows join their country cousins in their harvesting operations. From the time of the ripening of the corn until its gathering, the Sparrow lives almost entirely at the expense of the farmer. Even if one grant that the bird is not an inveterate enemy, it is far too numerous, and in its hosts drives other birds away, whose good qualities are less debatable.

The nest of the Sparrow is an untidy mass of straw, feathers, rags, and other soft materials, which it places in any available crevice in a building. Very often the little bully will instal itself in the home of the martin or swallow. When the Sparrow builds in a tree the nest is domed, and has an entrance in the side. The eggs vary from four to six and are white, speckled with grey or brown.

The Tree Sparrow (*P. montanus*) is a lighter-coloured bird, that does not always nest in trees, sometimes selecting such situations as a crevice in a cliff or wall, etc. Often it will build in the bulky foundations of a rook's nest, just as its continental town cousin will take lodgings at the bottom of a stork's heap of sticks.

THE CANARY (*Serinus canarius*)

The true Serin Finches, of which there are a score of species, are mostly confined to Africa ; the Common Serin Finch is a summer migrant to Central Europe, and only visits our shores by accident. One of the best-known species is the Canary, found chiefly in the islands of that name. The plumage of the wild bird is a mixture of olive-green, black, and yellow in varying proportions. Only upon very rare occasions are storm-tossed birds found upon our southern coast.

The Canary is the favourite cage-bird *par excellence*, almost all the world over, and the varied notes of the trained bird far surpass those of the wild one. German Canaries of the Harz region are famed for the sweetness of their song ; but for size and length of singing life, our own Norwich songsters are, perhaps, unrivalled. In the East Anglian city quite three or four thousand people are occupied in the Canary-rearing industry. Good average singing-birds realise anything from three half-crowns to a couple of guineas ; but for exhibition purposes £50 have been paid for a single bird. One firm was under contract to keep the palaces of the late Sultan of Turkey supplied with golden songsters, and the value of one consignment alone has amounted to £300. Not a few varieties of Canary cage-birds would scarcely be recognised by their wild brethren ; some have distinct crests, and in hue vary from the palest yellow to the deepest orange ; this last is produced by the provision of special 'colour-food,' dark orange in colour, and consisting largely of sweet pepper. The Canary is often crossed with some of our native singing-birds, notably the linnet, and the 'mule' is considered to have a sweeter song than either of its parents.

THE BULLFINCH
(*Pyrrhula europæa*)

The Bullfinch is so named on account of its full neck and rather

BULLFINCH

disproportionate head. Above, it is a mixture of lustrous purple-black and bluish ash, except for some white feathers at the commencement of the tail; the cheeks, breast, and flanks are red; the wings are banded with buff and grey, and the abdomen is white. It is well distributed throughout the British Isles; too well, gardeners aver, for in spring the bird's diet consists largely of the flower buds of fruit trees. The friends of the Bullfinch maintain that it is but in search of concealed insects that in any case would destroy all hope of fruit, and for the harm which it may occasionally work in this direction, it amply atones in winter, when it feeds almost exclusively upon berries, and the seeds of noxious weeds.

Naturally, the song of the Bullfinch is low, and at best only a pleasant warble. It possesses, however, wonderful imitative faculty, and will learn the song of another bird with remarkable facility. In captivity it can be taught to whistle or 'pipe' almost any tune, and a capable, piping Bullfinch sells at a good price. The method of teaching it is to confine the bird in a dark room, accustoming it to the required air, which is played on a bird-organ, or even a small clarionet. The bird quickly imitates the notes, and by degrees learns the whole tune. In addition to its musical capabilities, the Bullfinch is an extremely sociable bird, quickly recognising its human friends, and readily coming at a call.

THE CROSSBILL (*Loxia curvirostra*)

The Crossbill, a very common bird in the pine, larch, and fir forests of Northern Europe, is a comparatively rare and local visitor to some of the northern portions of the British Isles, although it has been known to breed in England. At rather long intervals quite large numbers of the birds cross over the North Sea, particularly in the year 1888 and again in 1910.

At first glance one might wonder why Nature should endow the Crossbill with a deformed bill, for the points of the mandibles quite cross each other in front. Feeding largely upon fir and other cones, this construction of the beak is just that which is best adapted for extracting the seeds. Holding a cone firmly with its feet after the manner of the parrots, the bird inserts its mandibles under the scales of the cone, levering them up to lay bare the seed which it scoops out with its horny-tipped tongue. By the same means the Crossbill easily splits an apple so as to get at the pips. Even an almond shell presents no difficulty, for after picking a hole in it, the mandibles wrench it open as easily as one could do it with a knife. A Crossbill confined in a cage will prize up nails and twist the wires completely out of shape. The plumage of the bird is green, orange, yellow, and reddish brown, differing according to age and sex. The nest of little twigs, mosses, and wool, is preferably built high up in a fir tree; the eggs are bluish white, spotted with red. The mandibles of the young birds are at first uncrossed.

THE BUNTINGS

The Buntings form rather a numerous sub-family, most of them being natives of the northern portions of the Old World.

The Common, or Corn, Bunting (*Emberiza miliaria*) is very generally distributed over almost all Europe, Asia Minor, and North Africa. Though it is not the commonest of the British Buntings, it is a permanent resident, and in autumn and winter its numbers are largely augmented by visitors from the north. Its colour is yellowish brown, with dark spots above; the underparts are yellowish white, with dusky streaks and spots. Its song is harsh, and has been compared to the breaking of glass. The nest is placed low down in a hedge, or on the ground among coarse grass; the eggs are dull white, with a yellow or pinkish tinge, streaked and spotted with dark purple-brown.

The Cirl Bunting (*E. cirlus*) is easily distinguished by its black chin and throat, and the brownish-red back, with dusky spots. It is not abundant in England, and, being more impatient of cold than some of its cousins, keeps pretty strictly to the south of the Thames. Its habits are more or less identical with the succeeding bird.

The Yellow Bunting, or Yellow Hammer (*E. citrinella*), is a familiar resident in the British Isles; and its bright yellow head and breast



CIRL BUNTING

and white feathers in its tail inevitably attract attention. When disturbed, it flits away about twenty yards in front, repeating the manœuvre several times as it is approached; but finally it wheels overhead and returns to the spot from which it started. Its rapid repetition of the one note, concluding with two harsher ones, is well represented by the words, "A little bit of bread and no cheese." The nest is usually close to the ground; the eggs are purplish white, spotted and scribbled with dark purple-brown.

The Ortolan Bunting (*E. hortulana*) is only one of our rare summer visitors from Northern Africa, although vast numbers that migrate to the Continent extend as far northwards as Sweden, where it sings throughout the Arctic summer nights. Its plumage is a mixture of browns, black, and greenish yellow. About September the birds depart from their summer quarters for Africa, at which season vast numbers are netted and fattened for the table. They are kept in a dark room and are fed on oats and millet, until they are mere lumps of fat.

The Snow Bunting (*Plectrophenax nivalis*) is black on the back and part of the wings, with a red tinge here and there ; the head and remaining parts of the body are white. The species is common in northern regions, migrating in considerable numbers to the British Isles for the winter ; in the few instances that it remains in the summer to breed, it selects the highest mountain-tops in Scotland for the purpose. A nest shown in the South Kensington Museum was found in Banffshire at an elevation of 3700 feet. In its native home in the Arctic north and in Scotland the nest is usually placed in a crevice among stones or under a rock, and the museum specimen is lined with deer hair and ptarmigan feathers. The eggs are greenish white, spotted with red and purple. During the winter months our visitors flock with larks, and hence are frequently termed 'White Larks.' This Bunting sings a sweet and musical lay while it is in the air ; and unlike most birds the female chants almost as well as her mate.

FAMILY : PARIDÆ

THE TITS

In this family are numerous small birds, some or other of which are found over all the globe except South America and Australia. They are seldom migratory, and the plumage is more or less alike in both sexes. When the breeding season is at an end most of the Tits form flocks, often in company with tree-creepers and other small birds, ranging the countryside in search of insect food.

The Great Titmouse (*Parus major*), Tomtit or Ox-Eye, is a familiar British resident, frequenting gardens, orchards, and copses. It is a prettily marked bird ; its head and throat are black ; back, olive-green ; breast and belly, yellow ; cheeks and nape, marked with white ; and there is a black line down the centre of its breast. In the spring it lives chiefly upon insects, for which it actively searches the bark of trees. When insect-hunting, the Tomtit adopts some remarkable attitudes, for its hind claw is markedly curved and affords it much facility in clinging. It will hang upside down or sideways, and will secure spiders, caterpillars, etc., with remarkable quickness. It feeds to some extent upon buds, but principally only because they contain noxious grubs. Its

note is bell-like, but not particularly musical; and it frequently vents sounds not unlike the sharpening of a saw.

The Great Tit is a particularly pugnacious little bird, for notwithstanding its title, it is no bigger than a sparrow. It is accused of killing the defenceless young of other birds. Whether this be so or not, at the conclusion of a fight in which it is victorious, the Tit will peck out the brains of the vanquished with its sharp little beak; and if introduced into a well-stocked aviary it will probably kill all its inmates in turn.

The Great Tit usually nests in a hole in a tree; but it frequents human habitations, and often selects the quaintest situations for its home, e.g. an unused garden-pump, flower-pot, etc. In the year 1890 a pair of Tomtits built their nest in the village letter-box at Rowfant, Essex, and in due course seven white eggs with rusty specks were laid. Although the box was in constant use, letters frequently lying on the sitting bird's back, she exhibited no concern, nor did she leave the nest, even when the box was cleared. A brood of five young birds was successfully reared, and the original box and the nest are now in the British Natural History Museum.

The Blue Tit (*P. caeruleus*) is a much smaller bird, but in any weighty argument will more than hold its own with its bigger relative. The distinguishing features of its colouring are the blue crown encircled with white; white cheeks; olive-green back; bluish wings and tail, and the yellow underparts. Its song is a weaker edition of the notes of the foregoing birds. The Blue Tit builds in almost any hole in a tree, bank, or wall, and often in least-expected places; its nest is a loose construction of grass, moss, wool, feathers, etc. The eggs, which frequently number a dozen, are similar to those of the Great Tit, but smaller. When disturbed in its nest the bird will hiss and peck an intruder's fingers, in consequence of which it is known as 'Billy Biter'; other names are Blue Cap, Bottle Tit, Blue Tomtit, etc.

The Coal Tit (*P. ater*) and Marsh Tit (*P. palustris*) are easily distinguished from each other; the former has a black



LONG-TAILED TIT

head and throat, with white on the cheeks and nape; the latter is blacker, and is without the white.

The Long-tailed Tit (*Acredula rosea*) is chiefly white on the head, neck, cheeks, throat, and breast; the back, wings, and the middle feathers of the long tail are black; there is a streak of the same colour over the eye; and the underparts are greyish white, warming into a rosy hue on the sides and flanks. The nest of this Tit is an exquisite construction. It is egg-shaped and composed of white lichen, hair, wool, cocoon webs of spiders, and the silken hammocks of various caterpillars. The whole is admirably woven together and lined with as many as three thousand separate feathers. This beautiful home is generally built in the middle of a bush in such a manner that it is difficult to remove it without cutting away the branches to which it is attached. The eggs, greyish white, sparingly specked with light red, vary in number from eight to twice as many. It is considered probable that sometimes two hens lay their eggs together and elect to keep a joint nursery. Otherwise it is wonderful how a single pair of birds could supply so numerous a brood with food; and in any case it is marvellous how the long-tailed little Tits can be brought up unruffled in so restricted a space.

The song of the Long-tailed Tit is a delicate twitter developing into a prolonged trill. Extremely sociable birds, the old ones and their young reside together in perfect harmony until the next pairing season. This species exists almost solely upon insects, and the systematic manner in which a family party will explore a fruit tree is interesting to a degree. The little bird-acrobats often swing head downwards as they cling to slender and swaying branches, intent upon gathering their insect food. This bird has a score of different names, such as Bottle Tom, Mum-ruffin, etc.

THE WRENS

The Common Wren (*Troglodytes parvulus*), rather less than four inches in length, is a merry, cheerful little creature with a remarkably sweet and well-sustained song, doubly endearing because even snow does not always daunt the vocalist. It is garbed chiefly in reddish brown with dusky bars; and over the eyes is a narrow light streak. 'Jenny Wren' or 'Tiddley-creeper,' as it is called among other names, often makes its home in a hole in a decayed tree, or among knotted ivy branches. The nest is a domed structure, and generally harmonises beautifully with its surroundings; if near bracken, dead leaves form a part of the material; if in a hayrick, hay is used. A Wren will often build three or four nests before definitely settling down to housekeeping; barns, hedges, and waterspouts are usually selected as sites; but a nest is often found in a scarecrow, and sometimes in a pump, access being gained

to it by means of the spout. The eggs, very small and as many as twelve in number, are sometimes plain white, but more generally spotted with red.

The Wren figures largely in various legends and doggerel rhymes, for example :

“ Whoso kills a robin or a wren,
Ne'er expect to prosper again.”

Nevertheless, one legend in particular puts the little bird in rather bad odour. It relates that when St. Stephen was about to escape from his guards, his plan was frustrated by a Wren breaking into song, and awaking one of the soldiers. Consequently, the Wren is hunted to death just prior to Christmas, and the bodies are kept until St. Stephen's Day, when boys decorate holly boughs with the feathered victims, and carry their trophies from house to house, soliciting alms. Other traditions are equally unhappy for the Wren. In some parts of Ireland it is believed that a Wren perched on a drum and awoke some sleeping invaders, just when the Irish soldiers were stealing upon them unawares. Fortunately for Jenny Wren superstition is now less rife than formerly, and the custom of stoning the Wren is honoured more in the breach than the observance.



WREN

The Common Wren belongs to the family Troglodytidae, which must not be confused with the family Regulidae, of which the following bird is the best-known member.

The Gold Crest (*Regulus cristatus*), or Golden-crested Wren, measuring only three and a half inches in length, is the smallest of our feathered inhabitants ; it is often called the ‘Bee-bird.’ In colour its upper parts are olive, tinged with yellow ; the cheeks are ashy ; wings, greyish brown with white bands ; crest, bright yellow in front, orange behind, and marked on each side with black lines ; and underparts yellowish-grey. In size no bigger than many humming-birds, in colour it would pass muster among the brilliant denizens of the tropics ; but it is able to endure an English winter, in addition to which large numbers come to us from the Continent in autumn. Under the branch of a fir-tree is a common location for

the nest, which is prettily constructed of moss, leaves, spiders' webs, lichens, etc., surrounding a lining of feathers. The six to ten eggs are cream colour, merging into reddish brown at the larger end.

The Fire-crested Wren (*R. ignicapillus*), with its brilliant orange crest, is a slightly larger bird, but is not nearly so common as the foregoing.

FAMILY: ALAUDIDÆ

THE SKYLARK (*Alauda arvensis*)

There are more than a hundred species in the family ; most of them are entirely terrestrial in their habits, and may be readily recognised by the great length of the claw of the hind foot. Only two species are resident in the British Isles.

The Skylark is a prime favourite of the Nature poets, and no bird's flight and song have given rise to more exaggerated panegyrics.



SKYLARK

The bird is soberly garbed, principally in brown of different shades, varied with a very little white and sparing tinges of yellow. On the top of the head the feathers form a dark brown crest with paler edges. It is widely distributed everywhere in this country, especially in grass lands and cultivated fields ; but our native birds are reinforced in autumn by vast numbers from the Continent. During the colder portions of the year Larks

congregate in immense flocks, which is the bird-catchers' opportunity to capture them in thousands. The Sussex Downs in particular yield a rich harvest for the poulterers' shops, although spitted Larks are not nearly so important an article of commerce in England as in several other European countries.

The Skylark is mainly an insect eater, but it has a weakness for the tender shoots of sprouting corn. The nest is on the ground, usually under the shelter of a tuft of long grass, often among growing

crops, or even in the hoof-print of a cow or horse. The eggs are greyish, speckled with darker grey or brown.

The song of the Skylark is a joyous carol, surpassed only by the notes of the nightingale. The bird commences to sing early in spring, and, except for a break about July, continues its musical efforts for six or seven months. Rising from the ground, it begins its blithe, jubilant song when at a height of only a few feet, and continues its 'harmonious madness' while soaring upwards, until it appears as only the merest speck. Notwithstanding poetic statements to the contrary, the Skylark never ascends beyond the range of a keen eye. Nevertheless, the bird does attain a great height, and it throws out its florid melody for from fifteen to twenty minutes, and sometimes for twice as long. It is often singing at 2 a.m. in midsummer, and at 10 p.m., after darkness has fallen. Confinement in a tiny cage does not daunt its musical spirit. During a bird-singing competition I have heard a Skylark sing at night in a crowded, smoke-laden room for almost ten unbroken minutes.

The Woodlark (*A. arborea*) is a smaller bird than its aerial cousin ; its upper parts are more reddish, and its under parts are more yellowish. It does not extend northwards beyond Stirling, and is nowhere very common. It perches and sings upon the branches of trees, which is never a habit of the Skylark. Its liquid song is also poured out while it is soaring, which is accomplished in circles, and not by ascending perpendicularly or simply veering to the right and left, which is the method of the 'ethereal minstrel.' The Woodlark is a ground builder ; its eggs are greyish white, speckled and streaked with brown.

FAMILY : MOTACILLIDÆ

THE WAGTAILS AND PIPITS

Of half a dozen species, all of which are graceful in form and movement, the Pied Wagtail (*Motacilla lugubris*) is the commonest in the British Isles. It is only a partial migrant, for some birds are to be found all the year round on our southern coast, although the majority leave us for warmer regions until spring returns. Its plumage is variegated with white and black ; its song is a hurried warble. It lives chiefly on flies and other insects, which it catches as it runs and hops about, flirting its tail continually, and frequently jerking upwards to snatch at an insect on the wing. Because of its habit of frequenting the banks of ponds and streams the bird is often termed the Water Wagtail, and other names for it are 'Wang-tail,' and 'Washerwoman.' Its flight is peculiarly hesitating, as though constantly proposing to alight and then changing its mind. Its nesting-place is generally in a cleft in a bank, a hole in a wall, and crevices of all descriptions ; but it is not infrequently found

in the roofs of buildings, haystacks, etc. The eggs are dull grey with ash-brown spots and streaks.

The Yellow Wagtail (*M. campestris*) is chiefly pale olive on the upper parts and yellow below, and over the eye is a pale yellow streak. It is one of our best-known summer visitors, but takes its departure in September. Its sharp, double call-note is very



YELLOW WAGTAIL

similar to that of its black and white relation, and its sweet song reminds one of the robin. The nesting-place is on the ground, preferably under a stone sheltered by rank grass and herbage. The eggs are whitish, mottled with differing shades of brown.

The Grey Wagtail (*M. melanope*) is a noticeable bird with its bright yellow under parts, black throat, and pale streak over the eyes; the grey upper parts, from which the bird takes its name, are really the least conspicuous portion of its garb. It is often mistakenly called the Yellow Wagtail, but Winter Wagtail is sufficiently appropriate, as the bird comes to us in autumn and retires northwards in spring. It seldom nests in the south of England, preferring the northern counties and the south of Scotland, where it builds in a bank, or between stones. The majority of nests are in the vicinity of water, but sometimes several miles away from it. The eggs are a delicate bluish white clouded with dark grey.

THE TREE PIPIT (*Anthus trivialis*)

The Tree Pipit is one of our most delightful summer visitors, arriving in April, and nesting in well-timbered valleys in May and

June. It is also called the Tit-lark, Field-lark, Pipit-lark, etc. Its garb is a mixture of ash, olive, and dark brown above; the breast is buff; the wing is banded with yellowish white; and the throat is dull white.

The nest is composed of grasses, moss, rootlets, and wool, with a lining of fine grasses and hair. It is generally placed in a bush or tuft of grass. Railway embankments are favourite nesting resorts. The eggs show considerable variation. Generally greyish brown spots appear upon a ground of purplish red or yellowish white; but not infrequently they are streaked and spotted with a dark chocolate tint.



TREE PIPIT

The Tree Pipit's song consists chiefly of a delicious trill, not unlike that of the canary. The bird usually rises warbling almost perpendicularly from the ground. After hovering in the air it descends with wings and tail extended like a parachute, the song increasing in volume until it returns to the branch or ground.

MEADOW PIPIT (*Anthus pratensis*)

The Common, or Meadow, Pipit very much resembles the foregoing bird, except that its underparts are more reddish. It is general almost throughout all Europe; in the British Isles it is chiefly a resident of waste moorlands. Its song, which is chanted on the wing, is pleasing, though inferior in range to that of the last-named bird. Mr. Hudson thus describes the song: "To sing he soars up to a height of forty feet or more, then glides gracefully down, with tail spread and wings half-closed and motionless, presenting the figure of a barbed arrow-head. In his descent he emits a series of notes, with little or no variation in them, slightly metallic in sound, and very pleasing. These notes are occasionally repeated as the bird sits motionless on the ground."

The Meadow Pipit's nest is very often selected by the cuckoo in which to lay her eggs. Though Pipits are small birds, less

than six inches in length, they combine together to attack the intruder and defeat her purpose, alighting even upon her back to enforce their objections. Usually the bigger bird deposits the alien egg, after which the Pipits philosophically accept the situation, and in due course forage early and late to satisfy the appetite of their foster-child.

FAMILY : HIRUNDINIDÆ

THE SWALLOWS AND MARTINS

In this large cosmopolitan family are included the true Swallows and Martins, and various close allies numbering nearly a hundred and twenty species. Their wings are long and powerful; their feet are feeble, but well adapted for clinging; and their bills are small, flattened, and of remarkably wide gape, specially fitting their owners for hawking insects on the wing.

THE SWALLOW (*Hirundo rustica*)

The Swallow resolutely refuses to know winter or winter's cold, for, being strictly a flying-insect eater, it can only exist where its food



SWALLOW

is on the wing, insects and their larvæ elsewhere being outside its scope in Nature's scheme. No bird is more popularly associated with the subject of migration; its coming is welcomed as the harbinger of summer weather, and its departure announces the approach of winter. Some old naturalists fancifully believed that some of the Swallows remained with us to hibernate during the cold months. The Rev. C. A. Johns, however, records seeing what was either a Swallow or a Martin on Christmas Eve, hawking for gnats

along the face of a cliff. The season was as mild as it often is in April, when the migrants arrive, and as the bird had existed so long, there was no reason why it should not survive until the warm weather would bring more abundant food. Nevertheless,

this instance must only be accounted an exception to prove the rule. In April, 1908, the arrival of the Swallows was followed by a heavy fall of snow, and though it remained on the ground only a short time, the feathered children of the sun perished in great numbers.

The Swallow spends nearly all its waking hours in tireless flight in pursuit of insects, so that it is always in condition for its journeys between Africa and the British Isles, in the course of which it keeps rigidly to one or two well-defined routes. It will not break its journey by descending to land, but it often alights upon vessels a hundred and twenty miles out at sea ; and is said even to sink to rest on the waves, from which it arises refreshed to continue its flight. There is nothing more wonderful in Nature than the well-ascertained fact that after its sojourn amid Africa's palm groves, the Swallow will return to its identical nest under the eaves of an English barn or cottage ; seven years in succession one marked bird showed its faithfulness to its old home.

The Swallow is a prettily marked bird ; the dark upper parts show violet reflections, the underparts are reddish white, and the forehead and throat are chestnut. The tail is long and forked. Its nest is of mud and straw ; it is shallow and open, and lined with feathers. It is generally placed in chimneys, shafts, or in any dry and dark corner in a tower, barn, or underneath a bridge ; very rarely it is located in a tree. The eggs are white, spotted with red and dark brown. Two broods are the rule, and sometimes the second family, too weak for long flights, is deserted by the parents, who are unable longer to resist the migratory instinct that urges their flight southwards.

THE HOUSE MARTIN (*Chelidon urbica*)

The House Martin is so much like the swallow in its flight, food and migratory habits, that nothing further need be said upon those points ; but in colour its underparts are pure white, instead of reddish. General interest is probably more concerned with the nest of mud, cup-shaped, and usually fixed under the eaves of houses or ledges of cliffs. The outer case is built up of pellets of clay from a pond side. • The eggs are white, speckled with ash and red. The song of the swallow is only a pleasing twitter, but the House Martin has a delicious, bubbling warble which, more often than not, it sings while on the nest.

THE SAND MARTIN (*Cotile riparia*)

The Sand Martin, the smallest of our British Swallows, has a wider range than any other Passerine bird, for it is found throughout the greater part of the Old and New Worlds. It frequents steep banks, railway cuttings, quarries, sand-pits, etc., in which it tunnels holes varying from one to six feet in length, slanting a

little upwards, and sometimes winding to avoid stones. The Sand Martin's beak is short, stout, and pointed, and makes its way through sandstone with astonishing rapidity, the loosened sand being pushed out with the feet. Excavating operations are usually restricted to mornings, and the tunnel is the work of several days. The nest of straw, grass and feathers is placed at the end of the tunnel, which widens into a chamber. The rather long eggs are pure white in colour.

The Sand Martin is a particularly sociable bird. Sometimes the nests of the house martin form a long line of mud habitations with party walls; but the Sand Martin lives in a very numerous community, the tunnels often running into a common passage; and if a location is deserted for any reason, the whole colony removes, and leaves no self-opinionated stragglers. Living strictly on an insect diet, the Sand Martin often hawks in company with the swallow and the house martin.

FAMILY: STURNIDÆ

THE STARLING (*Sturnus vulgaris*)

The Starling is one of the commonest birds resident in the British Isles, and in autumn and winter its numbers are augmented by hosts of migrants. It is a handsome bird, for though in the main it is glossy black, the green and purple reflections, the cream-coloured tips of the upper feathers, and the white-edged tail coverts give it an air of marked distinction. The Starling, like the sparrow, is at home in either town or country; in the former it builds its nest in any crevice in high buildings, and in the latter, holes in trees, and deserted sand martins' tunnels are favourite situations. The nest is an untidy collection of straw, grass, wool, moss, and even paper. The eggs are a pale greenish blue.

For the greater part of the year the Starling is principally an insect feeder; in sheepfolds it will perch on a sheep, and work energetically to rid it of ticks. Its appetite is voracious, the stomach of one bird having been found to contain fifteen snails of various kinds, several perfect beetles, and many grubs. Against such undoubted usefulness must be placed the bird's liking for fruit, especially cherries.

The song of the Starling is a drawn-out whistle, with various chirping, twittering, and gurgling notes. In captivity it can be taught to imitate almost any bird. Not infrequently the wild bird adds the notes of other songsters to its strange musical-box. Thus, from the roof of a house overlooking a busy, crowded street is sometimes heard a note that one would not expect to hear within many miles of the spot.

When the breeding season is ended the birds flock together, and explore the district for miles around; and it is at this time that the bird-scarer needs to be especially watchful, if their depredations

are to be prevented. A flock of Starlings in flight is wonderful to watch, the whole of the birds appearing to be under the command of a single bird, and obeying orders with a spontaneity that is little short of a miracle. At one moment they form figures almost geometrical in their exactitude, and the next, are nearly indistinguishable, because every bird has turned to present only the edge of the wings to the eye. A pheasant, accidentally flying across the path of a manœuvring flock, has been killed by the shock. Where the Starlings couch for the night they will sometimes crush whole acres of osiers to the ground by their united weight.

There are numerous other species of Starling, of which only two can be mentioned. The Rose-coloured Pastor (*Pastor roseus*) is a beautiful bird of Asia Minor and Africa. Its head is crested; its upper parts somewhat resemble our native bird, but its lower parts are rose colour, and wings and tail lustrous brown. Only rarely does one of these birds find its way to our shores—an accident that the particular stranger never repeats, for it is sure to fall into the hands of the collecting maniac, who prefers to see beautiful birds in glass cases. The advent of a rare species is generally made known only when the proud gunner writes to the press to chronicle his feat. Such instances almost make bird-lovers wish that the writer would transfer himself to some little-known region, where he would meet with a warm, if not similar, reception upon his arrival.

Although there is little resemblance in their external appearance, the Ox-Peckers (*Buphaga*) belong to the Starling family. They feed largely upon the parasites which infest both wild and domestic cattle. In particular, they are the friends of such animals as the rhinoceros, in whose hide folds and flaps insects can readily secrete themselves.

FAMILY: CORVIDÆ

THE CROWS

It is claimed for the birds of this family that they are at the very head of the whole class Aves. Among them we find the most perfect type of wing, while the foot, too, is very highly developed. The family, which is of nearly universal distribution, is divided into three sub-families: the True Crows (*Corvinæ*), Magpies and Jays (*Garrulinæ*), and the Choughs (*Fregilinæ*).

THE RAVEN (*Corvus corax*)

The Raven, the largest of the Crows, is twenty-five inches in length, with a wing-spread of four feet. Its plumage is black with purple reflections. There are few portions of the Northern Hemisphere where it does not make its home in wide expanses of wild and uncultivated ground, and it exists in comfort in regions as widely different as Greenland and Spain. Its nest, usually placed

on a high rock or in a tall tree, is an irregular mass of grass, wool, and feathers ; if near the coast, seaweed will be largely utilised. The eggs are pale green, spotted with brown.

Though it is common on the Continent, in our country the Raven is only abundant in the north of Scotland, and such islands as the Orkneys and the Hebrides. A few are found on the Welsh hills, Dartmoor, rocky cliffs in Cornwall and Devon, and in various



RAVENS

wild Irish regions. Living almost entirely upon animal food, the bird was driven out of our cultivated districts in order to protect young lambs from attack ; away in the north it lives largely upon fish cast upon the shore. Sometimes the shepherds encourage the presence of Ravens in order to keep eagles away, for the more recognised bird of prey does not like to try conclusions with a big, and strong-beaked competitor. In such cases, how-

ever, the shepherds destroy the Raven's eggs, so that a pair of birds is not urged by a hungry brood to exceed their usual scavenging habits.

In many countries, even to this day, the Raven is regarded with awe, and is believed to possess mysterious intelligence. It is the first bird mentioned by name in the Bible, and its non-return to the ark is suggestive of the food that awaited it in the shape of drowned animals. It was forbidden to the Israelites for food ; it was considered a bird of augury by the Romans ; and in many countries, England among them, was supposed to be responsible for plague, pestilence and famine, ever prone to "shake contagion from its sable wing." In captivity the Raven exhibits a gravity that seems almost preternatural, mixed with a provoking spirit of mischief ; and the more marked its misdeed, the greater its air of absolute innocence.

THE CARRION CROW (*Corvus corone*)

This bird is only a small edition of the raven ; it is of rather wide distribution in England, less common in Scotland and Ireland. Notwithstanding its name, our native bird finds little opportunity of indulging in its taste for carrion, but in some warmer countries it is recognised as a useful scavenger bird. Like the raven, however,

it must plead guilty to killing sickly lambs when afforded the chance, and it always preys upon hares, rabbits, and small feathered creatures. Any chickens or young ducks in the neighbourhood of a couple of Carrion Crows with young, will be in constant peril. All of the Crow tribe exhibit intelligence, and not a little artfulness. The Carrion Crow is well endowed with caution and cunning ; while out hunting or feeding, one bird will watch while its



HOODED CROW

mate satisfies its appetite, and it is always a difficult matter to come within gunshot. It builds its nest in a tall tree, from which it has been known to remove its eggs when it suspected that they were in danger.

The Hooded Crow (*C. cornix*) is also called the Grey Crow, because its back and portions of its underparts are ash-grey. In flight, food, and general habits, it is practically identical with the last-named bird, with which it will always interbreed. Some naturalists maintain that it is but a lighter-coloured variety of the Carrion species.

THE ROOK (*Corvus frugilegus*)

The Rook is often popularly confused with the crow, although it possesses one unfailing external mark to assist in its recognition ; the base of the beak is destitute of feathers, and covered with a

white scurf, which is easily seen, even when the bird is on the wing. In one habit it differs completely from the crows, namely, its extreme sociability ; crows live only in pairs, and shun the haunts of men, whereas the Rooks live together in communities, preferably near human habitations. A rookery has been known to contain over 2600 nests ; and even when once rural spots have been transformed into busy city streets, the Rook will not desert the trees to which it is attached. In Gray's Inn, only hidden by tall buildings from some of the busiest traffic in London, are trees where Rooks have lived for many generations. Dwelling in the heart of London would naturally entail distant journeys in search of food ; but the birds are provided for by the Benchers of the Inn.

Controversy has waged hotly upon the subject of the Rook's diet. Its friends will enlarge upon the enormous number of insect pests devoured by the bird, to which its critics retort that 80 per cent of its food is stolen from the farmer in the shape of corn, shoots of root crops, etc. Really the Rook is not a whit less omnivorous than the crow, except that possibly it prefers insects and vegetable substances. It cannot be denied that in seedtime the Rook ravages the seed-drills ; in autumn it plunders the ripened grain, and often in the season between it ruins acres of young turnips, etc. Its delinquencies do not end there, for when hungry it will capture young rabbits, will eat pheasant and partridge chicks, and young birds generally, and it can never resist pilfering eggs. Whether, taking all the year round, the Rook's insect food more than counterbalances its depredations remains a debatable point.

Usually inhabiting a grove of trees near a house or in a park, the Rook pays for its accommodation in having the young ones thinned out every year. This annual persecution gives the bird an intense horror of guns. When feeding in flocks in the fields, or following the ploughman in search of worms, etc., turned up by the share, there is always a rook sentinel in a neighbouring tree, and the mere sight of a gun will cause it instantly to give the alarm. Towards evening the foraging Rooks may be seen returning from their feeding-grounds, often miles from home, to their resting-place—"The blackening train of crows to their repose."

JACKDAW (*Corvus monedula*)

The Jackdaw, the smallest of the Corvines, is only thirteen or fourteen inches in length, and in addition it is easily distinguished from its larger relatives by its slaty-grey collar. It is distributed over the whole of Europe, and is most common in Russia. It is general in the British Isles, nesting in trees, holes in rocks, cliffs, chimneys, church towers, ruins, and even rabbit-burrows. Though not nearly so gregarious as the rook, the Jackdaw is a very sociable bird, and a considerable number will build in the same tree, cliff,

or tower. As many as a hundred pairs have been found on one English cathedral.

It is a matter for regret that London has so few Jackdaws ; there is a small colony at Kensington Palace, but out of the great number of churches in the metropolis, the bird nests in not more than half a dozen towers. One London bird-lover bought a hundred Jackdaws, which were advertised for sale for use in shooting matches, and gave the birds their liberty, hoping they would take up their quarters in the city. The result seemed to point that the Jackdaws had probably sought country quarters.

Various birds, whose normal plumage is black, are occasionally found clothed completely in white. There are white blackbirds and white ravens, though the rarity of the latter has passed into a proverb ; but white Jackdaws are comparatively common, and in the shops of London bird-dealers there are any day perhaps a score of these freaks in colour.

The nest of the Jackdaw is often an amazing mass of sticks, grass, straw, shavings, feathers, etc. The eggs are bluish grey, spotted with darker grey and brown. Sometimes the bird smears its eggs with clay, probably to render them less conspicuous to some of its marauding relatives, such as the crow and the jay.

The Jackdaw has a most accommodating appetite, feeding upon insects, worms, grubs, small reptiles, mice, eggs, young birds, offal of every description, grain, fruit, etc. Very often it feeds and roosts with rooks out of the breeding season, and it is also found on the seashore in the company of gulls.

The voice of the wild bird is merely '*jack*,' but in captivity it can be taught to imitate the human voice, which causes it to be viewed as a popular pet. The Jackdaw's impudence and precocity are always highly amusing. It has a decided bent for mischief,



JACKDAW

especially in the direction of hiding any glittering object, which often accounts for the loss of money, jewels, etc., that are left within its reach.

THE MAGPIE (*Pica rustica*)

Though the Magpie has a longer tail than any of the foregoing members of the Corvidæ, it is only eighteen inches in length. Its head, neck, throat, and back are velvety black; the under-plumage is white; and the tail and wings are black, with lustrous blue and bronze reflections. It has various Oriental relations that are garbed in brilliant hues, but, nevertheless, our native Magpie is a handsome bird. It is, perhaps, more abundant in France than in any other country; in the British Isles it favours some localities more than others, being particularly numerous in Cornwall and Wales, increasing in Ireland, and but little known in the Fen district. In England the bird rarely nests in the vicinity of houses, though Mr. Yarrell records seeing a score of Magpies in Kensington Park, a statement that could not be made nowadays.

In Norway the bird displays wonderful confidence and fearlessness, and often nests in quite low trees in the middle of a village; but in that country our perky friend happens to be considered a token of good luck, whereas we view it as a feathered brigand, whose actions call for the strictest surveillance. In not a few districts it has been almost exterminated for the harm it works to the eggs of game birds; it kills young hares and rabbits, and it ruthlessly preys on all smaller birds. Snails, worms, frogs, and caterpillars are always welcome items in the bird's menu, but it has a strong leaning towards fruit and grain.

The nest of the Magpie, a structure of sticks roofed with thorns, is built upon a foundation of mud and clay. Sometimes it is placed in tall hedges, but usually in lofty trees. The eggs are pale bluish green, with small markings of purple and brown. Although displaying great attachment to its mate, and dauntless courage in defence of its young, its affections seem to be rather transient, and quite unable to withstand the test of absence. For example, if one Magpie of a pair be shot, the survivor never fails to find another mate within the course of a few days, sometimes, indeed, within twenty-four hours.

This inquisitive Paul Pry among the birds is rather easily tamed, and quickly learns to repeat words. Its audacity and downright cunning render it an interesting pet, but its mischievous tricks are often a sore trial; it is an accomplished thief, hiding its spoil with aggravating ingenuity. To young children it is often a positive terror, taking a fiendish delight in pecking their bare legs; but when the victims' screams bring older persons to the rescue, the artful bird at once takes refuge in flight.

THE JAY (*Garrulus glandarius*)

Unlike the preceding birds of the family, the Jay is seldom seen outside the thickest woods. It is a beautiful bird ; its general plumage is reddish grey ; crest, greyish white streaked with black ; black mark below the eye ; and the greater coverts and the winglet are barred with black, blue, and white. The bird feeds upon vegetable substances more than the true crows ; its specific title means 'a lover of acorns,' but it visits gardens for young peas, beans, and fruit. Eggs and young birds are a favourite food of the Jay, which has been seen to kill a full-grown thrush, and pheasant and partridge nests suffer severely. For this propensity it is particularly hated by gamekeepers, who lose no opportunity of adorning their vermin poles with the brightly plumaged marauder.

Ordinarily the note of the Jay is a rather soft cry, but its note of alarm is a harsh screech.

When it is startled, it dashes off in alarm, uttering its loud squawk which warns every other creature in the neighbourhood of the danger, and thus earns the enmity of the poaching fraternity. In captivity the bird will learn many words, for which imitative faculty it suffers considerably, as bird-fanciers not infrequently split the mimic's tongue, under the mistaken idea that its speaking powers will be improved. In any case it soon learns to talk, and will mock the bleating of sheep, the cackling of poultry, the grunting of pigs, and even the neighing of horses with wonderful truth.

The Jay's nest is an open structure of twigs, lined with fine roots and grass ; it is sometimes built in the top of a thick bush, but more often in a high tree fork or branch. The eggs are dull green in colour, speckled with olive brown.



JAY

THE NUTCRACKER (*Nucifraga caryocatactes*)

Leaving the better-known crows we come to the Nutcracker. It is a native of the pine regions of Europe and Siberia, and its autumnal visits to our country are of rare occurrence. About the size of the jackdaw, the Nutcracker is the first of the Corvines to deviate largely from a severe garb, chiefly of solid black. It presents mainly a study in chocolate-brown, uniformly spotted with white, except the quill feathers and greater wing coverts. Its bill is long, straight, and pointed, and the nostrils are covered with whitish feathers, pointing upwards. The Nutcracker is not only garbed differently from the true Crows, but it possesses a musical voice, and in captivity the bird warbles a sweet song that one little expects to hear from a member of its tribe. This species feeds mostly upon seeds, especially those of the pine, beech, and various nuts, and it breaks the hard shells by fixing the nut or pine-cone in a convenient crevice, and hammering with its beak until it has exposed the kernel. It is also able to dig grub out of tree-trunks, discovering them through its quick sense of sight and hearing.

The nesting habits of the Nutcracker do not lend themselves to easy observation. Not only is the bird exceedingly shy in the breeding season, but its home is amid the pines, often at a considerable elevation above sea-level, and the eggs are laid early in the season, while the region is yet covered with deep snow. The nest is often half-domed; the eggs are bluish green, spotted with ash-brown.

THE COMMON CHOUGH (*Pyrrhocorax graculus*)

The Common Chough has a wide habitat, ranging from Europe to China. It is rather longer than the jackdaw, and differs from the true Crows in possessing long and pointed wings, and orange-red legs and bill.

Generally the Chough builds its nest on dizzy cliffs and headlands in the south-west of England, Wales, Isle of Man, the Hebrides, and Ireland. It is in such situations secure from human interference, except at the hand of the experienced cragsman; but even here it does not escape the peregrine falcon, which has had more than a little to do with the Chough's decrease in numbers in the British Isles. The bird sometimes wanders from its coast haunts, when the 'Red-legged Crow,' as it is very often called, will build in a ruined castle or abbey. In Asia this same species of Chough may be found in Ladak, seven hundred miles from the seashore.

The Alpine Chough (*Pyrrhocorax alpinus*) has a yellow, instead of a red bill. It is the chief corvine of the Alps and Pyrenees, where its chatter reminds one of our more familiar jackdaw.

MISCELLANEOUS BRITISH PASSERINE BIRDS

There remain various Passeres that are permanent British residents, and a still greater number that are more or less frequent visitors, of which the following birds are typical examples.

The Common Tree-Creeper (*Certhia familiaris*) has its habits signified in its name, its long, slender bill and claws adapting it for climbing tree-trunks and capturing insects. It ascends a trunk spirally, probing the cracks in the bark in search of food. It is a pretty little bird, garbed chiefly in various shades of brown and buff-white; the tail feathers are reddish brown and are stiff and pointed. The nest is usually placed between the bark and bole of a tree; it consists chiefly of bark, decayed wood, and twigs, with a lining of moss, hair, and feathers. The eggs are white spotted with yellowish red and lilac. Another member of the family Certhiidae is the beautiful Wall-Creeper of Southern Europe and Asia; but only upon rare occasions has it visited England.



TREE-CREEPER

The family Sittidae embraces birds in Europe, Asia, Australia, and America. They are near relatives of the tit-mice; they possess wedge-shaped bills, and can climb trees with almost the same facility as the woodpeckers. The Common Nuthatch (*Sitta cæsia*) extends throughout Central and Southern Europe to Northern Africa. It is one of our resident birds, chiefly met with in the southern counties. Its upper plumage is bluish grey; underparts, orange-red; and other colours present are white, black, and grey. It feeds on insects, beech-mast, acorns, seeds, etc. Hazel nuts are its favourite food, wedging them into crevices in a tree trunk, and breaking them open by repeated blows of its strong bill. 'Nut-jobber' is another name for the bird. The nest of bark and leaves is generally made in a hole in a tree-trunk, the aperture being plastered with clay so as to leave only a very small entrance. A

nest exhibited in the British Natural History Museum was taken out of a haystack ; no less than eleven pounds of clay were used in its construction. The eggs are white, spotted with purplish red.

The Flycatchers form the numerous family *Musicapidae*, the members of which possess a common feature in their flattened bill and the bristly hairs that more or less cover the nostrils. The Spotted Flycatcher (*Musicapa grisola*) is soberly clothed in ash-



PIED FLYCATCHER

brown above, and white beneath; its sides are longitudinally streaked with brown, and its flanks are tinged with red. Its song is only a weak chirp. It comes to us from Africa in May, being one of the later summer migrants. Its food consists almost wholly of soft insects captured on the wing, for which the bird watches from a bough, post or rail. It is not at all timid, and will permit an ob-

server to stand quite close to it. The nest of grass, hair, and moss is often placed between the branch of a trained tree and a wall, against the bole of a tree, or in a crevice in a wall. The eggs are bluish white, marked with reddish spots. The bird is also called 'Bee-Bird' and 'Wall-Bird,' and another name, 'Cherry-Chopper,' leads to much wrongful persecution for fruit pilfering, of which it is guiltless.

The Pied Flycatcher (*M. atricapilla*) is chiefly garbed in black and white. Arriving in April, it chiefly frequents the northern counties, but is not nearly so common as the foregoing. Its eggs are pale blue, and are not spotted.

The Dipper, Water-Ouzel, or Water-Thrush (*Cinclus aquaticus*) is our native representative of the family *Cinclidæ*, the members of which are excellent divers and use their wings like oars, as well as to propel themselves under water. It is a little less than a black-bird in size, and is black above with a white throat and breast. For its low, melodious song it is unique among aquatic birds,

although very often its notes are drowned by the roar of the torrent. Frequenting in particular the rocky streams of Scotland, North Wales, and Derbyshire, the Dipper may sometimes be seen actually walking on the bottom of a pool as it searches for insect food. The nest, an oval structure of moss, leaves, etc., with an entrance in the side, is always placed near to the water's edge; in some cases it is under a waterfall, and the bird can only enter and leave it by passing through a vertical sheet of water. The eggs are pure white. The young Dippers take to the water as soon as they are able to leave the nest.

The Laniidæ family consists of the Shrikes, or Butcher-Birds. Some of them are insectivorous; but the larger ones exist chiefly on small mammals, birds, and reptiles, for which the strongly



GREAT GREY SHRIKE

hooked and notched bill specially fits them. The Red-backed Shrike (*Lanius collurio*) visits England and the south of Scotland in summer. The nest of this noisy bird is rather large, and if not conspicuous in a tree or hedgerow of itself, insects, such as bees and beetles, are often impaled upon thorns in its near vicinity. Formerly it was supposed that the Shrike thus decoyed other birds to the spot for the purpose of killing and devouring them; but the impaled insects form only the Butcher Bird's own larder. The Great Grey Shrike (*L. excubitor*) sometimes visits us between autumn and spring, but never breeds in our islands. It is ten inches in length, and has a wing spread of more than a foot. The larder of this bird often contains mice, frogs, and small birds in addition to insects.

The family Oriolidæ, or Orioles, are brightly plumaged birds,

chiefly yellow and black, ranging throughout nearly the whole of the Old World from Europe to Australia. The Golden Oriole (*Oriolus galbula*) often visits our southern shores, especially Kent, Cornwall, and the Scilly Isles. Its tropical appearance, however, stirs up the covetousness of the collector of bird mummies, and the Oriole is wiser when it selects Spain, Southern France, and Italy for its breeding quarters. The nest is overlaid with lichens to make it appear part of the branch nearest to it; it sometimes rests between the fork of a horizontal branch, or it is suspended from twigs by a kind of cordage. The devotion of the mother bird to her white eggs, spotted with brown or black, is such, that she will suffer herself to be carried away rather than desert them. It is said that the Golden Oriole is so fearful of exposing itself, that it never perches upon a naked branch, always preferring those boughs which are most thickly covered with foliage, and which will consequently afford it the best shelter. The reader must not confound this bird with the American Orioles, or Hang-nests (*Icteridæ*), which, though of brilliant black and yellow plumage, are more nearly allied to the starlings.

The Waxwing belongs to the family Ampelidæ, or Chatterers,



WAXWING

although it happens to be a singularly silent bird, rarely uttering even its call-note twitter. About the size of a thrush, the Waxwing is a bird of marked elegance; its upper plumage, including the crested head, is purplish red; the throat is black; the wing coverts are black, edged with white, and the tail is black, tipped with yellow. But the bird gains its name from the tips of the secondary quill feathers, which look as if red sealing wax had been pressed upon them. Notwithstanding its brilliant coloration, the Waxwing is a northern bird, very common in Norway and

Russia, and only visiting our shores at irregular intervals.

MISCELLANEOUS FOREIGN PASSERINE BIRDS

A necessarily brief consideration of an immense family may very well conclude with a few birds that are never seen in the British Isles in a wild state, only rarely reaching our shores as specially interesting and usually short-lived captives.

The Mocking Bird, itself forming a distinct family, the Mimidæ, is not very far removed from the true thrushes, and the bird is frequently called the 'Mocking Thrush.' The male and female differ but little in their plumage. The upper parts are dark brownish ash ; wings and tail, nearly black, the primary feathers being white at the base show that colour on the wing ; the whole of the greater coverts and the tips of the lesser are white ; and the under-surface is pale brownish white. The nest is usually placed in some thick bush, and is very carefully concealed.

The Mocking Bird is an amazing vocalist. Its own song is full and exceedingly varied, and even if it ended there the bird would be a popular one for cage confinement. But the Mocking Bird possesses the imitative faculty to an astounding degree, reproducing with remarkable fidelity, not only animal and bird sounds, but almost any noise that is produced artificially. Says Mr. Wilson : " He whistles for the dog ; Cæsar starts up, wags his tail, and runs to meet his master. He squeaks out like a hurt chicken ; and the hen hurries about, with hanging wings and bristled feathers, clucking to protect her injured brood. The barking of the dog, the mewling of the cat, the creaking of the passing wheelbarrow, follow with great truth and rapidity. He repeats the tune taught him by his master. He runs over the quiverings of the canary, or the clear whistlings of the Virginian nightingale, with such superior execution and effect, that the mortified songsters feel their own inferiority and become altogether silent ; while he seems to triumph in their defeat by redoubling his exertions." It is a very remarkable circumstance that one single bird always assumes the mastery in each district, and that whenever he begins to sing the others cease from their performance, and retire to a distance from the spot where the master-bird has taken his stand, and that their voices are only heard as if in distant echoes to his nobler strains. Unfortunately, the Mocking Bird does not long survive in confinement in this country, and, consequently, one desiring to hear its performance must travel to North America or the West Indies.

The Weaver Finches, notable members of the family Ploceidæ, are remarkable for their peculiar modes of nesting. In the accompanying photograph are shown several ingenious homes, constructed by the Indian Weaver Bird (*Ploceus baya*), the result of the joint efforts of the male and female, the one working inside

the nest, and the other outside. They strip long and flat ribbons from the blades of native grass, and fly with them to the nest.



NESTS OF WEAVER FINCHES

Then they proceed to interweave them, the one on the outside pushing the grass through the nest to its companion within, and she, on her part, pulling it through, and then pushing the end out to her mate.

Many other birds, however, construct pensile nests; but the Sociable Weaver Bird (*Philæterus socius*) of South Africa adopts an entirely different method. Hundreds of these birds in one community, join to form a structure of interwoven grass, containing various apartments, all covered by a sloping roof, impenetrable to the heaviest rain, and enlarged year by year, as the increase in numbers of the community may require. This compound nest con-

sists of a canopy, the eaves of which are completely covered with nests, crowded one against another. Usually these great nests break down by their own weight. As long as the weather is dry, the branches are strong enough to bear them. But when the rainy season comes on, and the nests are loaded with water, the branches give way under the additional weight, even the tough acacia boughs being unable to bear up against the abnormal strain.

The Long-tailed Whydah, or Widow-bird (*Vidua principalis*), is a member of the same family. It is a native of South Africa,

and is remarkable not only for its brilliant colours, but also for its exceedingly long tail feathers, which are so elongated as to impede the bird's flight. There are several species, all brilliantly plumaged and in great favour in aviaries, which require to be roomy on account of the peculiarly long tail.

The Bird of Paradise, of which there are fifty different species in the family Paradiseidæ, is a native of New Guinea and a few neighbouring islands. Strange as it may seem on the face of it, the bird is a not very distant relative of the Crows. Only a moderately sized bird, it possesses the most extraordinary development of plumage to be found in the whole feathered creation. Mr. Wallace, who spent many months in the study of these birds, was only able to secure specimens of five different kinds, and even at the present time very little is known concerning the habits of most of them. They are fruit and insect-eaters, and three favourite items in their menu are figs, locusts and grasshoppers. The eggs are usually two in number, and the nest is placed in a tree-top.

The Greater Bird of Paradise (*Paradisea apoda*) was first seen in Europe, when a friend of Magellan's brought two skins as a gift from a native chief to the King of Spain. The natives always cut off the ugly feet and legs when drying the skins, and forthwith the Portuguese and Spaniards attributed wonderful powers to these legless marvels; they were creatures of the atmosphere, lived on dew and vapours, and never touched earth until they died. Hence the specific name of this species. Let Mr. Wallace describe the feathered miracle of colour:—

“The body, wings and tail are rich coffee-brown, deepening on the breast to a blackish violet or purple-brown. The whole top of the



GREATER BIRD OF PARADISE

head and neck is of an exceedingly delicate straw-yellow, the feathers being short and close-set so as to resemble plush or velvet ; the lower part of the throat, up to the eye, is clothed with scaly feathers of an emerald-green colour, and with a rich metallic gloss, and velvety plumes of a still deeper green extend in a band across the forehead and chin as far as the eye, which is a bright yellow. . . . The two middle feathers of the tail have no webs, except a very small one at the base and at the extreme tip, forming wire-like tendrils, which spread out in an elegant double curve, and vary from 24 to 34 inches long. From each side of the body beneath the wings springs a dense tuft of long and delicate plumes, sometimes two feet in length, of the most intense golden-orange colour and very glossy, but changing towards the tips into a pale brown. This tuft of plumage can be elevated and spread out at pleasure, so as almost to conceal the body of the bird."

Words alone fail to give any correct idea of the beauty of many of these gorgeous birds.

The Lesser Bird of Paradise (*P. minor*) differs from the last named "in its lighter brown colour not becoming darker or purpled on the breast ; in the extension of the yellow colour all over the upper part of the back and on the wing coverts ; in the lighter yellow of the side plumes, which have only a tinge of orange and at the tips are nearly pure white, and in the comparative shortness of the tail tendrils." The female of the Greater Bird of Paradise is a plain and ordinary-looking bird in a uniform of coffee-brown ; that of the Lesser is entirely white on the underparts. In their first year the young males are similarly simply attired.

In the family Ptilonorhynchidæ are the Bower Birds, of which there are several species restricted to Australia and New Guinea. All of them are in the habit of building arbour-like bowers of sticks and twigs, where the males play or pay court to the females. One species constructs a rather long gallery, which it ornaments with shells, feathers, or any bright object that attracts its decorative fancy ; but the taste of the Gardener Bower Bird (*Amblyornis inornatus*) leans more to gaudily coloured flowers, fruits and insects, which are renewed as fast as they become faded.

There are only three species in the family Menuridæ, of which the Common Lyre Bird (*Menura superba*) of Australia is not only typical, but the best known. It was discovered as far back as 1798, and was first viewed as a species of pheasant, although from its tail it might possibly belong to the Birds of Paradise. Some naturalists prefer to view it as forming an order of its own, and in many respects it is difficult to reconcile it with either of the two great divisions of the Passeres. Apart from the remarkable lyrate-shaped tail feathers, the bird easily resembles some of the Gallinæ, possessing extraordinary powers of running with feebleness of flight ; the well-developed legs and feet are fitted with stout, curved claws,

with which the Lyre Bird scratches up the soil in exactly the same manner as our domestic fowl. The general plumage is a dull brown, inclining to rufous on the quill feathers; the tail is much longer than the body, and the outer pair of feathers that form the lyre have reddish-brown bars on a light ground. In running through



LYRE BIRD

the bush the male carries its feathery lyre horizontally, but the tail of the female requires no special care, being only of quite ordinary shape. The former is in the habit of constructing hillocks, upon which it stands to display its feathers to the best advantage. After moulting, the bird does not get its full tail feathers until June, and sheds them again in October, so that its ornate appendage is an annual but short-lived glory. Only one egg is laid in the

oval, domed nest ; it is dark in colour, blotched with purplish brown.

With this bird we take leave of the Acromyodian group, although really only half of its families have been mentioned, and of the fewer Mesomyodians a couple of families must suffice.

The family Cotingidæ, or American Chatterers, are chiefly fruit-eating birds, but not a few of them add insects and even small reptiles to their usual vegetarian diet. They range over all tropical America, from Southern Mexico to Northern Argentina. In the more than a hundred species are many gaily garbed birds, and some of them are rather extraordinary in appearance, thanks to various appendages, that may be considered ornamental or not, according to taste.

The Bell Bird, or Campanero (*Chasmorhynchus niveus*), is best described by Mr. Waterton : " He is about the size of a jay ; his plumage is white as snow. On his forehead rises a spiral tube nearly three inches long ; it is jet-black, dotted all over with white feathers : it has a communication with the palate, and when filled with air looks like a spire ; when empty, it becomes pendulous. His note is loud and clear, like the sound of a bell, and may be heard at a distance of three miles. In the midst of these extensive wilds, generally on the dried top of an aged mora, almost out of gun-reach, you will see the Campanero. No sound or song from any of the winged inhabitants of the forest cause such astonishment as the toll of the Campanero. You hear his toll, and then a pause for a minute ; then another toll, and then a pause again ; and then a toll, and again a pause. Then he is silent for six or eight minutes ; and then another toll, and so on." The most anxious travellers cannot refuse to pause and listen to him, so sweet, so novel, and romantic is the toll of the pretty, snow-white Campanero.

To the Cock of the Rock (*Rupicola crocea*), which is an inhabitant of the Amazon regions, may be accorded the palm, not for variety, but the brilliant colouring of its plumage. The predominant colour is orange-red, but what, perhaps, equally strikes the eye is the compressed helmet-like crest, with various tufts of curled feathers growing out from the lower part of the back. The bird's plumage causes it to be remorselessly shot, as the feathers are in great demand for millinery purposes, though more will be said on this point in a later chapter.

The most remarkable feature of the bird is the conduct of the males in the breeding season, when they indulge in what may be termed love-displays, competing with each other to win the favour of the females, who are gathered together to witness the perform-

ance. One at a time each male advances with peculiar steps and hops, swaying the head and extending the wings. Only when tired does the performer withdraw to give place to another eager aspirant. When eventually the birds pair, they construct a nest of mud and sticks, which is generally attached to a ledge of rock. The buff-coloured eggs are spotted with reddish brown.

The Manakins (Family *Pipridæ*) are, as a rule, beautifully coloured small birds. They live in the forests of Central and South America, and are fruit and seed rather than insect eaters. One species is called the 'Dansador' or 'Fandango-bird,' because of its remarkable habit of dancing. A bird will often act as piper, while its friends dance to the music, jumping up and down with great regularity until the musician is exhausted, when another takes his place, and he joins the dancers.



COCK OF THE ROCK

ORDER: PICARIÆ

THE WOODPECKERS AND THEIR ALLIES

The Picarian birds have various peculiarities of structure common to most of them, but too technical for present consideration ; but, on the other hand, they display differences that cause some naturalists to separate them into three distinct orders. In some cases the first and fourth toes are directed backwards, and the second and third, forwards. Few of the Picarians construct a real nest, contenting themselves with a hole in a tree or bank in which they deposit eggs, which, in most cases, are white. The order contains about twenty-four families of which nearly half will be dealt with in some detail, namely : Woodpeckers (*Picidæ*), Toucans (*Rhamphastidæ*), Cuckoo (*Cuculidæ*), Kingfishers (*Halcyonidæ*), Bee-eaters (*Meropidæ*), Hoopoes (*Upupidæ*), Hornbills (*Bucerotidæ*), Nightjars (*Caprimulgidæ*), Swifts (*Cypselidæ*), and Humming-Birds (*Trochilidæ*).

THE WOODPECKERS

The Woodpecker, of which there are about four hundred species, is curiously modified to fit it for its mode of life. The beak is long, strong, and sharp, to enable it to peck into decaying wood in search of insects, although it can chip away tough, healthy wood, in order to make a hole for its home. The powerful feet are furnished with sharply hooked claws for clinging; the breastbone is flatter than in most flying birds, so as to enable the Woodpecker to press closely to a tree trunk; and the long tail feathers are stiff and pointed, forming a support upon which a busy, clinging bird can rest a great deal of its weight. To complete the Woodpecker's outfit, the tongue is long and protrusive, and covered with a glutinous secretion to which insects adhere when the weapon is poked into their hiding-places. The bird really works good rather than injury to trees. By means of tapping, it unerringly discovers unsound spots in the trunk where insects are in residence. The hole in which its operations result may be viewed as only a memento of a cure effected by a bird surgeon. The cavity which the bird makes for its home may not always come within this category, but it may be forgiven one annual lapse.

The Green Woodpecker (*Picus viridis*) is the largest and best-known of our several resident species; it is found in most wooded districts in England and Wales. Its olive-green upper parts and greenish ash underneath, together with its black face, crimson crown, and moustaches, cannot fail to be recognised at first sight. The visitor to the woods, however, is likely to hear it more easily than to see it, for it has a laughing note, harsh in sound, but given with a jovial earnestness, and hence another name for the bird, the 'Yaffle.' Nevertheless, it can be seen at work often, tapping the trees with wonderful rapidity. It generally runs up the trunk in a spiral direction, and when it descends it keeps its head uppermost. In this respect it differs from the nuthatch, which runs head foremost down a trunk with the greatest ease.

The Great Spotted Woodpecker (*Dendrocopus major*) is principally black above and white underneath; but there is crimson on the back of the head and on the abdomen, and white on each side of the neck. This bird chiefly frequents the southern and midland counties. The Lesser Spotted Woodpecker (*D. minor*) is mainly black, barred with white; its crown is bright red. Owing to its smaller size, and its fondness for high trees, it is less noticeable than the foregoing couple. It ranges but little outside our southern counties.

THE TOUCAN (*Rhamphastos ariel*)

The Toucan was one of the first birds to attract the notice of Europeans in Central America; for some of the natives were wearing

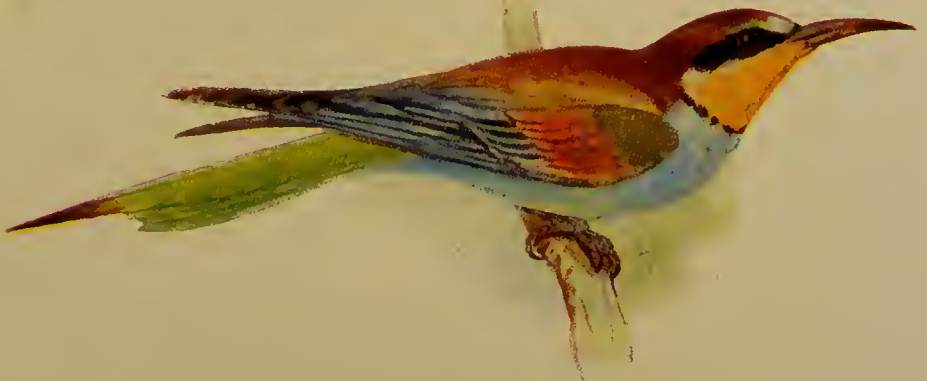


PLATE XVI

Great Spotted Woodpecker

Kingfisher

Cuckoo

Nightjar

Bee-eater

brilliantly coloured Toucan skins as ornaments. Why it should have so enormous a bill is not easy to understand, but how it carries it with ease can be seen by examining its texture. The



ARIEL TOUCAN

external surface is only semi-transparent horn, nearly as thin as paper, and internally it is but a honeycomb of bone. The huge beak is variously coloured in different species of bird, either scarlet, yellow, blue, or green being the predominant hue. The specimen figured is

black, with a yellow throat and scarlet rump; but some species are more gorgeously garbed.

The wings of the Toucan are rounded, and ill formed for rapid flight, but among the branches it displays great activity, springing from bough to bough with vigorous leaps. A great part of the year it exists on fruits, but during the breeding season it attacks smaller birds in their nests, and devours both eggs and young. It plucks off the feathers of a bird, crunches the bones, and then swallows the body entire. Nothing is more eccentric than the way in which the Toucan goes to roost. It does not tuck its head under its wing, but the long beak is laid over the shoulder along the back. When the soft-feathered tail is turned forward and shut down, the bill is almost hidden. The entire contour of the bird is altered; it is nothing but a ball of feathers.

THE CUCKOO (*Cuculus canorus*)

If only because its note closely approaches the human voice, the Cuckoo would claim more than ordinary interest; but the bird long mystified the earlier naturalists; some of its vagrant, uncertain habits still remain subjects for controversy, and in various respects it occupies a place in the popular imagination which no other bird can equal. It reaches England about the middle of April, and seeks open country, broken by clumps of trees, bushes, and hedgerows, ranging as far north as the lowlands of Scotland. It has been seen at Torquay on April 6th; but a less reliable authority once reported its appearance at Malvern on January 12th,

which could only have been a late-fledged bird, that so far had contrived to endure the cold weather.

The Cuckoo at once advertises its arrival by its well-known cry. It is the best example of two-noted birds, relieving by an ingenious variety of expression what would otherwise be monotonous. To the accompaniment of dipping head and cocking tail, quite often it ejects its notes with such frequency and abandon—calling as often as a hundred times in succession—as to make itself completely hoarse, a result which other birds studiously avoid. Its plumage is chiefly ashy grey above, whitish underneath, and the tail feathers are dark, tipped and spotted with white. Its low, scouring flight at first glance is suggestive of the hawk tribe; but neither in general contour, beak, nor claws, does the Cuckoo approach the predaceous bird.

The most remarkable circumstance connected with the life history of the Cuckoo is its parasitic habit of depositing its eggs in the nests of other birds, leaving to them the rearing and care of its own offspring. The nests of the pipits, wagtails, and hedge sparrow are very often selected, but taking continental birds into account, the feathered interloper lays its eggs in the nests of quite a hundred and forty-five different species, imposing equally upon the little British wren and the Spanish magpie. In all probability the bird deposits its egg in the same kind of nest as that in which it was reared; and during the season the vagrant may lay from five to a score of eggs. They vary considerably in colour; usually they are greyish green or reddish grey, speckled and mottled with darker shades of the same colours.

The young Cuckoo acts with the sheerest ingratitude. By means of its peculiar shovel-shaped back, it is enabled to push out of the nest either eggs or nestlings; and this it invariably does, and forthwith monopolises the fullest attention of the devoted, cheated foster-parents. Sometimes two alien eggs are laid in one nest, and instances of three are not unknown. The result, however, is always the same; the two young Cuckoos contend with each other for the mastery until at length one is ousted.

The wonderful instinct which so many birds evince in migration is developed to the highest degree in the Cuckoo. Most migrants travel in larger or smaller companies of their own kind, and often accompanied by other species; but the Cuckoo will come from Africa to England and return to it, alone. Stranger still, the old birds travel southwards in July and August, before many young Cuckoos are strong enough for the journey; yet, a little later, the young birds unerringly wing their way in the track of their vagrant parents.

THE WRYNECK (*Iynx torquilla*)

The Wryneck ranges over nearly all Europe and Asia, migrating southwards to Africa and India. In its annual visits to England it favours the south-eastern counties, and very rarely extends as far as Scotland or Ireland.

Generally preceding the arrival of the cuckoo by only a few days, it is commonly known as the Cuckoo's Mate or Cuckoo's Messenger. Its

plumage is mottled, grey, brown, and black on the upper parts; throat and breast, yellowish red; on the buffish white under parts are arrow-shaped black spots, and the tail is barred with black. Its common name is gained from its remarkably pliant neck, which the



WRYNECK

bird twists as though it were fitted with a ball-and-socket joint; on this account, and because it hisses when disturbed, the Wryneck is also called the 'Snake-bird.' Its note is harsh and high-pitched, and, in fact, its generic name is derived from a Greek word, meaning 'to shriek.' Though the bird is said to be fond of various kinds of berries, caterpillars, etc., are its main food, and it is particularly fond of ants and their eggs, in securing which its viscid-tipped tongue is particularly useful. The Wryneck's nest is formed only of a few chips of decayed wood in a ready-made hole in a tree, or occasionally in a bank.

THE KINGFISHER (*Alcedo ispida*)

The Kingfisher is undoubtedly the most beautiful bird that breeds in the British Isles, and in its gorgeous colouring vies with almost any bird of the Tropics. The crown of the head, cheeks, and wing coverts are an exquisitely brilliant blue, each feather

tipped with lighter blue ; the back is blue-green ; over the eye is a cinnamon-brown stripe, lightening as it extends towards the back ; the throat is white and the underparts a rich orange-red. But it is in its flight that the bird is a marvel of colour, sparkling like precious gems, or at other times a mere flash of blue-green light.

The Kingfisher is general in England and Wales, but rather rare in Scotland and Ireland. On all our streams in fertile meadows, especially those that abound in fish, may be met this richly coloured but voracious bird, with the straight, lengthened, and pointed beak. It glances backward and forward like a meteor, its hues flashing in the sun. Often it may be seen poising itself over the water, and then darting with astonishing rapidity, deep beneath the surface, but seldom missing the minnow or trout which it seeks. Bearing its prey in its beak, it returns to its resting-place. Without loosing its hold, the Kingfisher passes the captive between its mandibles, until it is grasped fairly by the tail, and then ends its struggles by beating its head against the branch or stone where it sits. It next reverses the position of the fish, and swallows it head foremost. During the winter months the bird leaves the inland streams, frequenting dykes and river mouths, especially on our southern shores.

The Kingfisher makes its home in a river bank for choice, often in the deserted hole of a sand martin or a water vole. The nest itself is simply a dirty heap of ejected fishbones arranged in a circle.

THE HOOPOE (*Upupa epops*)

There are half a dozen species of Hoopoe, several of which are



HOOPOE

confined to Africa, and one to India ; but the Common Hoopoe is widely distributed over temperate Europe and Asia, in winter migrating to India, Arabia, and Northern Africa. The bird takes its name from its note, which sounds like 'hup-up,' repeated quickly several times in succession, and produced by puffing out the sides of its neck.

The Hoopoe is not only a regular visitor to our southern counties, and even Ireland, but it would regularly

breed here if the "specimen hunters" would permit. The general colour of the Hoopoe's plumage is a beautiful fawn; the wings and lower part of the back are broadly barred with black and white; the tail, consisting of ten feathers, is black, crossed at the base with a crescent of white; the feathers of the crest are tipped with black. The bird, a foot in length, is graceful and animated, marching about in a stately manner; and it is constantly expanding and lowering its crest.

The Hoopoe passes much of its time on the ground, probing the soil with its long bill in search of worms and insects. The nest is generally placed in a hole in tree, rock, or wall. It is only constructed of light materials, but in offensive odours it vies with that of the kingfisher; for not only are the nesting materials cemented together with ordure, but the Hoopoe is the only bird that fouls its nest, and, consequently, the young ones are brought up in the most filthy surroundings.

THE BEE-EATER (*Merops apiaster*)

This richly coloured bird occasionally wanders as far as the British Isles, but never stays to breed. The head, neck, and back of the bird are chestnut, changing to yellow on the tail coverts, and then to green. The quill feathers are blue-green, tipped with black; the under surface is green, the throat is orange, and a bar of deep blue encircles the neck.

The Bee-Eater is a native of the South of Europe and the opposite continent of Africa, whither it retires during winter. It reappears in Spain during the first week in April in flocks of forty or fifty, scattering themselves over fields and gardens in busy pursuit of bees, wasps, butterflies, and grasshoppers. They take the insects while they are on the wing, skimming and darting along with great rapidity. Like the kingfisher, to which it is related, the Bee-Eater builds in clayey or sandy banks, especially such as border streams, making a deep burrow, at the extremity of which the eggs are laid without any further preparation for their reception.

THE HORNBILLS

The Hornbills are chiefly natives of Africa, India, and the Malaysian regions. There are many species, all of which exhibit the same extraordinary development of the bill, which, in the case of the Concave, or Two-horned, Hornbill (*Dichoceros bicornis*), has an addition in the shape of a concave casque, the whole giving the bird a more remarkable appearance than even the toucan. The yellow bill and its more or less orange-red attachment are really not weighty, consisting of very thin horn covering only light cellular processes. This bird's plumage is black and white, and hence it is often called the Great Pied Hornbill, for it is five feet in length, and is the largest of the family. Some Hornbills feed chiefly upon

fruit, but most of them mix their diet very considerably, and are practically omnivorous; the larger species eat small mammals, reptiles, and fish, but carrion is always welcomed.



CONCAVE HORNBILL

One great point of interest concerning the Hornbill is connected with its nesting methods. Like the toucan, it makes its home in a hole in a decaying tree, but with a marked difference. When the female commences to lay her eggs, the male bird from without, assisted by his spouse within, plasters up the hole until there remains only a very small aperture. Dr. Livingstone saw these birds in the Mopane country, where he noticed that the completed entrance to the nest is only a narrow slit by

which the male feeds his mate, the space exactly suiting the form of his beak. "The female makes a nest of her own feathers, lays her eggs, hatches them, and remains with the young till they are fully fledged. During all this time, which is stated to be two or three months, the male continues to feed her and the young family. The prisoner generally becomes fat, and is esteemed a very dainty morsel by the natives, while the poor slave of a husband gets so lean that, on a sudden lowering of the temperature, which sometimes happens after a fall of rain, he is benumbed, falls down, and dies. The female is said sometimes to hatch two eggs, and when the young are fully fledged, another two are just out of the egg-shells: she then leaves the nest with the two elder, the orifice is again plastered up, and both male and female attend to the wants of the young which are left." In all probability the plastering-up of the nesting hole is to protect the sitting bird, eggs, and young from marauding monkeys.

THE NIGHTJAR (*Caprimulgus europæus*)

The Nightjar is also called the Goatsucker, but it does not suck goats, although various superstitions to that effect are current in most European countries. Notwithstanding its owl-like face, the bird is not related to the owls; but it frequents bracken, and hence another name, 'Fern Owl,' is more appropriate. The title 'Nightjar' fits the bird excellently, for its habits are rather nocturnal, its flight is noiseless, and its cry is a long-drawn jarring or churring sound, not unlike that produced by drawing a hard substance across a large-toothed comb.

The Nightjar is one of our summer visitors, and is common in many parts of the British Isles, except in the north and west of Ireland. In colour it is chiefly brown, mottled in a complex fashion, with black, red ochre, and grey. This coloration renders the bird very difficult to detect when it is lying on stones or faded bracken. The head is large, and the staring eyes are capable of seeing in the twilight. Though the beak is small the gape is very wide, opening far behind the eyes. The upper mandible is furnished with long, stiff bristles, which assist in retaining insect prey, taken on the wing. The Nightjar builds no nest, but lays its eggs in a hollow on the ground; there may be a few dead fern leaves in it, but usually the two creamy white eggs, rounded at both ends, are on a bare spot.

THE SWIFT (*Cypselus apus*)

The Swift, a sooty-brown bird with a white chin, much resembles the swallow externally and in its habit of hawking insects on the wing. In structure, however, there are important differences, not the least being that all four toes are directed forwards. This remarkable formation of the foot assists clinging, and invests its owner with ability to run up a rough wall; but it prevents perching, retards walking, and causes the bird difficulty in rising from the ground. The usual note is clear and not unmusical; but it is often raised into a shrill screech, hence a popular name, 'Jack Screamer,' although it has several others, such as 'Black Martin' and 'Devil Swallow.' The bird spends the whole of the day on the wing, wheeling with wonderful velocity, and soaring until the eye can scarcely discern it.

The nest of the Swift is usually concealed in crannies under eaves; towers, ruins, and cliffs are also favourite locations. The building material consists of hay, feathers, and similar substances, glued together with saliva. The white eggs are larger than one would expect from a bird only seven and a half inches long. In feeding its young, the Swift hawks through the air until it has got quite a little pellet of food consisting of an almost incredible number of flies and other insects.

The Esculent Swift (*Collocalia fuciphaga*) is one of several species that are natives of south-eastern regions from Ceylon to Australia. This bird's nest is composed entirely of dried saliva, of which substance is made the famous birds'-nest soup, so esteemed by Chinese gourmands, who will pay £5 10s. per pound for the gelatinous dainty. It is said, however, that the soup owes its best flavours to the added ingredients, such as the gravy of a boned fowl, etc. The Swifts nest together in immense numbers in caves. Colonel Legge's description of one such spot is scarcely likely to induce Western people to hanker after the Chinese delicacy :

"The bottom of the cave was filled with a vast deposit of liquid guano, reaching, I was informed, to a depth of thirty feet, and composed of droppings, old nests, and dead young fallen from above, the whole mingled into a loathsome mass with the water lodged in the crevice, and causing an awful stench. Hundreds of frightened little birds screamed and whirred in and out of the gloomy cave with a hum like a storm in a ship's rigging."

THE HUMMING-BIRDS

The Humming-Birds are exclusively feathered gems of the New World. They glance about in the sunshine like streaks of brilliant light, their fine and elastic wings vibrating so rapidly as to make a humming or buzzing sound when hovering over a flower. Even with our greater knowledge of these birds, Waterton's description

has not been improved upon: "Though least in size, the glittering mantle of the Humming-Bird entitles it to the first place in the list of the birds of the New World. It may truly be called the Bird of Paradise, and had it existed in the Old World, it would have claimed the title instead of the bird which has now the honour to bear it. See it darting through the air almost as quick as thought! Now it is within a yard of your face—in an instant gone—now it flutters from flower to flower to sip the silver dew—it is now a ruby—now a topaz—now an emerald—now all burnished gold."



HUMMING-BIRD

The Humming-Birds are not restricted to the tropical regions, although the majority of the five hundred species are natives of Central and South America ; one species (*Selasphorus rufus*) in summer ventures as far north as Alaska ; another may be seen on the wing, even in snowy weather, in Tierra del Fuego ; and some frequent the vicinity of perpetual snow in the Andes of Ecuador, at a height of at least 16,000 feet. The largest species, the Giant Humming-Bird (*Patagona gigas*), is nine and a half inches long, reminding one of a large swift ; in flight it is as noiseless as a butterfly. Some of the smallest forms barely exceed a humble-bee in size, and one tiny creature, a native of Mexico, is said to lay an egg scarcely larger than the head of a pin.

The plumage of all Humming-Birds is brilliantly metallic, and the generally gorgeous *ensemble* is heightened by crests, tufts, ruffs, frills, and ornamental plumes of remarkable shapes. There is marked variety in tails, but no bird carries one more beautifully strange than the male Racquet-tailed Humming-Bird (*Loddigesia mirabilis*) ; it consists of only four retrices, the inner pair of normal length, but the outer pair curving in opposite directions, crossing each other with geometric exactitude, each end terminating in a 'racquet.' The Jamaican Humming-Bird (*Æthurus polytmus*) has two feathers of the tail moderately prolonged, crossing each other about the middle of their length to form a pair of beautifully prismatic scissors.

The tongue of these birds is long, slender, and extensile ; at its free end it is hollow, dividing into two slender branches that are margined with a membranous fringe. In practically all cases the bill is comparatively long, but is sometimes of remarkable length. The Sword-Billed Humming-Bird (*Docimaster ensiferus*) gathers insects out of long, tubular flowers. The Sickie-billed species (*Eutoxeres aquila*) has its bill not only long, but sharply curved into a semicircle, just the shape for exploring certain flowers, or removing spiders from the crevices of trees.

In 1907 over a dozen Humming-Birds arrived at the Zoological Gardens. Most of them were very exhausted, but recovered when placed on cotton wool upon the top of hot-water pipes. The house was specially heated, and the birds were fed upon syrup. Even in their somewhat confined quarters they would hover over a flower with rapidly vibrating wings. The photograph depicts Prevost's Humming-Bird (*Lampornis prevosti*), and as far as recollection serves it is nearly, if not quite, life-size.

ORDER : PSITTACI

THE PARROTS

There is no difficulty in recognising one of the Parrot tribe by the shape of the beak, which is short and strongly hooked,

the upper hinged mandible hanging far over the lower one. All birds with beaks of this type use the hooked apparatus to assist them in climbing, not excepting the crossbill, which is outside this order. The tongue is short, thick, and fleshy; the wings and tail are generally long, in some species even longer than the body. Ornithologists have differed concerning where to place these birds, and some would include them among the Picarians on account of their zydaetylous foot, typically furnished with two toes before and two behind. Although the order comprises about five hundred species, there are only two families, viz., the Psittacidæ, or True Parrots, including the Cockatoos and Macaws; and the Loriidæ, or Brush-tongued Parrots.

Of the true Parrots, which have the edges of the upper mandible toothed, there is no better example than the Grey Parrot (*Psittacus*



GREY PARROT

erithacus); it ranges across Africa from the Guinea coast to the east of Lake Nyassa. This short-tailed Parrot is almost wholly ashen-grey, except the tail, which is deep scarlet. In a wild state the bird lives largely on the palm-nut, banana, mango, and similar fruits. It makes no nest, simply laying its eggs in a hole. It is a very sociable bird, living in great companies, with nests occupying every available hole in the same tree. A Parrot in a cage can contrive

to make a deafening noise, by which one can judge of what a whole colony is capable, especially, for example, when mischievous monkeys are chasing the birds in order to pull out their tail feathers. The Parrots sit screaming exultantly on twigs, that they know will not bear the weight of a monkey, but in the end a quick hand

snatches out a tail, and the triumphant chatterings of the monkeys and the discordant screeches of the Parrots make an indescribable din.

The Grey Parrot's power of imitating all kinds of sounds is quite astonishing. A bird has been known to repeat faithfully all the sounds emitted by a dog, that was run over in the street. First there came the sudden, half-frightened bark, as the beast found itself in unexpected danger, and then the loud shriek of pain as a wheel passed over it, followed by a series of howls as the dog limped away and turned a corner in the distance. The bird's performance speaks eloquently of a tenacious memory and marked powers of observation, for it could not have heard such sounds more than once. The popularity of the Grey Parrot, however, rests more upon its ability to copy the human voice, and to carry in its memory quite a stock of words and phrases; and endless anecdotes might be quoted of humorous incidents connected with the accomplishment. It is one of the hardiest of cage birds, and many specimens have been known to attain threescore years and ten; one is recorded to have lived in a cage for a hundred years, losing its memory at sixty, and its sight at ninety.

Of numerous species none is more remarkable than the Owl Parrot (*Strigops habroptilus*), or Kakapo, of New Zealand. Its wings are fully developed apparently, but are almost incapable of flight. It generally prefers to remain on the ground, but when it climbs trees, it uses its wings as balancers in jumping from one bough to another. The bird has not only a disc of feathers round the eye, but it has much of the owl nature. It is strictly nocturnal, concealing itself in holes, under stumps of trees, and similar hiding-places until after sunset. The food of this bird is mostly obtained on the ground, and consists of grass, leaves, berries, roots, etc. No real nest is made, a couple of eggs being laid merely in the hole which the bird occupies during the day.

The Kea (*Nestor notabilis*) belongs to the Brush-tongued family. It is equal to a raven in size, and is a native of the South Island of New Zealand. Its general colour is olive-green, with black edges to many of its feathers. Though naturally a fruit and berry eater, the introduction of the sheep into New Zealand has led to the bird developing predaceous instincts. From picking up the scraps thrown from the slaughter-sheds, the Kea proceeded to attack sheep, "alighting upon the backs of the unfortunate ruminants, and tearing down through the skin and flesh until it reaches the kidneys, the fat of which is greedily devoured." Owing to the losses inflicted upon sheep-breeders, a price is paid by the Government for each bird killed, and their final extermination is probably almost within sight.

THE COCKATOOS

The Cockatoos, many of them large, crested, and finely plumaged birds, but possessing only moderately long and broad tails, are chiefly natives of the Eastern Archipelago and Australia. They usually nest in holes in decaying trees, making a hollow with their



GREATER SULPHUR-CRESTED
COCKATOO

powerful beaks. Subsisting solely on seeds and fruits, large flocks play havoc in cultivated fields; and consequently agriculturists destroy them in great numbers, their skins finding a ready market; but to those not specially interested in their depredations, a flock of Cockatoos is a beautiful sight. There are many different species, such as the Black, Pink, Bloodstained, and Raven, each of which has the distinguishing feature of its plumage signified in its name; but the most familiar occupant of our aviaries is the Greater Sulphur-crested Cockatoo (*Cacatua galerita*), a native of Australasia. It is a white bird with a bright sulphur-yellow crest. Like most of its race, it creates much amusement by its grotesque movements, its love of approbation, and its continual mention of its own name. The presence of a visitor always excites birds in captivity to animated conversation, the air resounding with 'Cockatoo,' 'Pretty Cocky,' etc., mingled with frequent yells and screeches, if the utterer does not receive immediate notice.

One of these birds will imitate the cries of other birds and animals with much fidelity, but articulates words rather indifferently.

THE MACAWS

The Macaws are easily the most conspicuous of all the Parrots, for not only are they large birds, but their tails are very long, and their whole garb is usually composed of a mixture of gorgeous hues, in which red, blue, and yellow largely predominate. There is never any doubt of the presence of these birds in their native forests, for they engage in the most deafening clamour, a habit that is not

given up even when in captivity. The Grey parrot is often boisterously noisy, but is quiet and subdued compared to its bigger relation, which, however, is a poor talker. The Red and Blue Macaw (*Ara macao*) is an inhabitant of the Amazon valley, ranging northwards as far as Mexico. It is three feet in length, of which the tail accounts for nearly two. The major portion of the upper and lower plumage is coloured vermilion-red; upper wing coverts, yellow; lower part of the back, upper and lower tail coverts, blue; and the tail feathers are scarlet, tinged with blue at their tips.

The Blue and Yellow Macaw (*A. ararauna*) is principally blue above and yellow below.

It is a grand sight to see a great flock of these birds flying overhead, but low enough to permit a full view of their gorgeous mantles. The natives find their flesh is good, and their feathers have a marketable value. In the settled districts, however, they raid the corn and maize fields, and work no little damage with their voracious appetites and powerful beaks.



RED AND BLUE MACAW

There are many smaller Parrots such as the Parroquets, which are found in the tropical regions of both hemispheres; but the beautiful little Love-Birds, no bigger than a sparrow, are second to none as favourite cage-birds. It is customary to sell them in pairs; and it is interesting to see them dress each other's plumage, caress each other, and in various ways show their mutual attachment. There are, however, exceptions to the rule. One gentleman thus describes the hen-bird of a couple in his possession: "She quarrels

with her husband, whom she drives about, compels to feed her with partly digested food from his craw, and then thrashes if he does not sit closely enough to her. In fact, a more henpecked wretch never lived, and yet he seems to like it, and to be specially proud of his beautiful but utterly unamiable wife."

The Lories and Loriguets vary in size from that of a dove to the last-named. In a wild state they often flock in immense numbers ; all of them are fruit and seed-eaters, but some have a decided taste for honey. Their plumage is usually brilliant, their voices noisy ; and as they are very poor talkers they are not largely kept as pets.

ORDER : STRIGES

THE OWLS

In this order are nocturnal birds of prey, allied on the one hand to the parrots, and on the other having certain affinities with the diurnal birds of prey. The eyes of these birds are not only more forward than in any feathered creatures yet described, but they are surrounded by a disc of stiff feathers, pressing back the thick, soft plumage that would otherwise obstruct the vision. The pupils are capable of great dilatation, but cannot endure the glare of the day ; and a bird is able to draw over its eye a thin, transparent membrane, which acts like a curtain against the painful annoyance of light.

The Owl can turn its outer toe backwards, thus converting it into a typically zygodactylous foot ; and the talons are singularly hooked and acute, well matching the strongly curved beak. The facial discs are partly turned forward, leaving exposed the large orifice of the ear, for sharpness of hearing is as needful to the Owl as clearness of sight. The whole plumage, except the facial discs and the quill feathers, is extremely soft and downy, offering little resistance to the air, so that the bird is borne along as lightly and silently as a plume of thistle-down upon the breeze.

The nesting-place of the Owl varies according to the species, but it is nearly always in a dark spot, in a crevice in a building, tree, rock, a deserted bird's nest, or a hole in the ground. The eggs of the Owl are white, and can always be distinguished from those of any other bird, being nearly spherical, and the exterior extremely rough. The Owl feeds upon small mammals, mice, rats, voles, fishes, reptiles, moths, insects, and to a very small extent upon birds. It swallows its prey entire, casting up the indigestible parts in the form of pellets consisting of, for example, the skins and bones of mice, wing cases and wings of night-flying beetles, etc.

The Owls, of which there are quite two hundred species, range from the Arctic Ocean to Australasia. They form two distinct families : the Strigidæ, or Barn Owls, and the Bubonidæ, or Horned and Wood Owls.

THE BARN OWL (*Strix flammea*)

The Common Barn Owl, White, or Screech Owl, extensively spread throughout Europe, Asia, and America, and common in the British Isles, is one of the best types of the whole order. This bird is fourteen inches long ; its upper surface is a delicate tawny-yellow, clouded with grey and brown lines, and powdered with little white dots ; the face and underparts are white. The legs are feathered or plumed to the toes, which are covered with fine hair.

In our country this Owl has been one of the most persecuted of the feathered race. Habitually a dweller in the farmer's barn, this aerial wanderer of the night - destroys more mice than any privileged cat. "When it has young," says Waterton, "it will bring a mouse to the nest every twelve or fifteen minutes during the evening and night, nor are rats safe from its attack." Nowadays the bird is better understood, though depredations in the pigeon loft are often ascribed to the Owl, and sometimes to the starling, instead of to the real delinquent, the omnivorous rat. An examination of the ejected pellets



BARN OWL

of the Barn Owl at once yields abundant evidence in its favour, for every pellet will contain from four to seven skeletons of mice. From one nesting hole have been taken out more than a bushel of pellets, the accumulation of sixteen months only.

By day the Owl conceals itself in its dark retreat. At twilight it issues to skim along the ground in search of food, quartering a meadow with the regularity of a spaniel. It will take a fish swimming near the surface of the water ; it seizes its victim with its

claws, and does not employ its beak until it commences to devour its prey.

Strictly speaking, the Barn Owl makes no nest, depositing its five to seven eggs in a hole, usually with no better bed than ejected pellets of bone and fur. The eggs are laid at irregular intervals, and thus young birds and eggs are often found in the nest at the same time. Both male and female share in incubating the eggs, and frequently sit upon them side by side. The cry of this Owl is often a loud scream ; hence the name, 'Screech Owl.' It also hoots, snores, and hisses, this last especially when interfered with in the nest. The name 'White Owl' is gained from the white underparts, which are shown when the bird is flying in the early twilight. Other names given to it are Church Owl, Madge Owl, and Yellow Owl.

EARED OWLS

The Tawny Owl (*Syrnium aluco*) much resembles the barn owl ; but owing to its more nocturnal habits and duskier plumage, it is not so often seen as it is heard. It is the largest of our British species, and is a well-known prowler of our woods and forests ; but it also nests in old oaks and elms in quite populous urban districts.

The Long-eared Owl (*Asio otus*) is well known in the wooded districts of Great Britain ; and in autumn additional numbers visit us from the Continent. It is one of the handsomest of the British species ; on the upper surface it is whitish and reddish brown intermingled ; while underneath it is buff, streaked and barred with dark brown and rusty cream. The outstanding feature of the bird lies in the long, erectile ear-tufts, streaked with dark brown ; and the legs are covered with fawn-coloured feathers to the toes. Very often this Owl occupies an old nest of the crow, magpie, ringdove, or heron, but in its general habits it much resembles the Barn Owl. It utters a mewing kind of cry, but on the whole is one of the quietest of the family.

The Short-eared Owl (*A. accipitrinus*) is much like the last-named, except that it is a trifle longer, and has shorter ear-tufts. It is a more northern bird than either the Barn or Long-eared species, and is commonest in Scotland, but not found in Ireland.

The Short-eared Owl prefers fields and open moors, and generally nests on the ground. The continental birds of this species prey largely on voles, lemmings, etc. During the great vole plague in Scotland in 1891-2 great numbers of Short-eared Owls were attracted to the infested district. More than that, the birds to a greater extent than usual remained for the winter, instead of migrating ; and in the spring not only did they lay larger clutches of eggs, sometimes a dozen, but the Owls reared two broods instead of one.

This species is often called the "Hawk-Owl"; it has been known to snatch up a chicken from a farm-yard at midday.

The Great Eagle Owl (*Bubo ignavus*) is spread over a large portion of the earth, and at one time was frequently to be seen in the British Isles. Nowadays, however, only a solitary specimen is encountered at long intervals. In Northern Europe the Eagle Owl, which is two feet in length, carries off the fawns of the stag, roe-buck, and reindeer, and works much havoc among winged game.

THE SNOWY OWL (*Nyctea scandiaca*)

This beautiful bird emulates the hawk in its habit of hunting by day. It is a native of the Arctic regions of both continents, but has been seen occasionally in the north of Scotland. The thick and specially downy texture of its plumage declares it to be a dweller among snow-clad wastes; in fact, scarcely a single point is left exposed; the bill is almost concealed amidst the mass of feathers enveloping the head, and the toes are clothed with a long, thick, hair-like covering, leaving the claws alone visible. In the desolate regions, where the sun in summer never dips below the horizon, and the darkness of winter is dispersed by the unceasing flashes of the Aurora Borealis, the Snowy Owl sweeps along in search of the ptarmigan, the Arctic hare, and various small quadrupeds which constitute its food. With a boldness like that of the peregrine falcon, it will follow the hunter by the day together, skimming down, "when a bird has been shot, with such rapidity as to carry off the prize before the sportsman can get within reach of it."



SNOWY OWL

ORDER : ACCIPITRES
THE DIURNAL BIRDS OF PREY

The fierce and bloodthirsty hunters of the air, that are comprised in this order, are endowed with special powers and weapons to fit them for their modes of life. All of them are clothed with firm plumage, but they possess neither the facial discs nor, with one exception, the reversible fourth toe of the owls. Their sight is remarkably keen, and reference has been made in earlier pages to the wonderful mechanism of the eye which affords a rapid change of focus.

The Accipitrines were considered by the older naturalists to be at the head of the Birds, which increased knowledge shows can only be assigned to them on account of the prominence, born of brute strength and ingrained ferocity ; although from some points of view, a rapacious bird, swooping down with remorseless certainty upon its prey, appears to indicate a very high development of bird life.

The order can be divided readily into five families, viz., the Osprey, Hawks and Eagles, Vultures, the Secretary-Bird, and the American Vultures.

FAMILY : PANDIONIDÆ
THE OSPREY (*Pandion haliaëtus*)

In its eyes and its hard plumage the Osprey, or Fishing Hawk, is indubitably an Accipitrine, but because it can reverse its fourth toe the bird is often referred to a separate order, the Pandiones, forming a link between the Owls and the Diurnal Birds of Prey.

The range of the Osprey is almost world-wide ; it used to breed regularly in many parts of Scotland, where it is now an increasingly rare summer visitor, and only to spots where it is protected from interference. The bird's wings are long, extending beyond the tip of the tail, and having an expanse of fifty-four inches. The upper plumage is a rich, glossy brown ; parts of the head and neck are yellowish white ; the underparts are white with a brown band across the breast ; and the tail is barred alternately with stripes of a lighter and darker colour. The nest is a mass of sticks, turf, grass, or seaweed in a tree or on a rock.

The sole food of the Osprey is fish, salt- or fresh-water. Hovering over the water, it captures not only fish that approach near to the surface, but those at some distance below it, plunging like a plummet, and emerging, shaking the sparkling drops from its graceful wings, as it bears a silvery fish aloft, held securely in its sharp claws. Often, however, the white-headed eagle has been interestedly awaiting the result of the Osprey's operations, and with an awful shriek swoops down upon the encumbered captor, and forces it to relinquish the prize.

FAMILY : FALCONIDÆ

The Falcon family includes several subordinate groups agreeing in their general outlines, yet marked by essential differences. Taken as a whole they are the lions, tigers, and leopards of the feathered beings. They enact a war of ruthless extermination, they live by slaughter, and their nests are the scenes of a never-ending succession of bloodstained feasts. Their carriage is free and noble, their eyes piercing, their body firm and compact, and their flight rapid and impetuous. Their beak and talons are hooked, sharp and formidable. In many cases the female is larger and fiercer than the male. They live alone or in pairs on seashore cliffs, high mountains, wide heaths and moors, or in secluded forests. All are busy and active in the destruction of life. All, however, are not equal in courage; some attack birds and quadrupeds larger than themselves; others direct their efforts against more feeble creatures, lizards, snakes, frogs, mice, etc. The family includes the falcons, hawks, kites, eagles, buzzards, and harriers.

THE PEREGRINE FALCON (*Falco peregrinus*)

Of the true Falcons the acknowledged chief is the Peregrine Falcon, which, with slight variations, is pretty general all over the world. It is found on nearly all our lonely cliff-bound shores or suitable rocks inland, especially in the north of England. It takes its specific name from the migratory habits of the young birds, some of which come from the Continent to our eastern coast in autumn and stay until spring. The upper part of the plumage is a blackish lead colour, but lighter and more ashy on the back; the lower plumage is dirty white with transverse bars of brown, and there is a triangular dark patch below the eye. The



PEREGRINE FALCON

length of the male bird is sixteen inches, and its weight about one pound ten ounces.

The nest of the Peregrine Falcon is usually only a hollow on a cliff ledge, and sometimes an old nest of a crow or raven is chosen. Being a bird of rather powerful build, this Falcon preys upon such birds as pigeons, partridges, ducks, etc. Its flight is astonishingly rapid. Arrived within a few feet of its prey, it protrudes its powerful legs and talons to their full stretch, and the wings for a moment are almost closed. The next instant the prize is grappled, which, if too weighty to be carried off directly, is forced obliquely towards the ground to be killed and devoured on the spot.

In former times the bird was universally employed in the aristocratic sport of falconry, and the heron was the usual quarry. The Falcon cannot strike from below, and the heron instinctively tried to mount above its enemy. Generally the Falcon's endurance enabled it to gain an advantageous position, and then it swooped down, struck the heron with its talons, and the two birds fell to the ground together. The female Falcon was the bird chiefly selected for this sport, being larger, one pound heavier, and swifter and fiercer of disposition; it is not by weight that birds of prey overcome their victims, but by sheer dash and energy added to beak and talons. The male, called a 'tiercel' or 'tassel,' was only used for the capture of the partridge, magpie, etc.

The Jerfalcon (*Hierofalco gyrfalco*) inhabits the northern regions of both hemispheres. It is larger and handsomer than the last-named, but lacks its determination and energy. A well-known writer declares that it frequently flies the five hundred miles from Iceland to Scotland, and returns to its home on the same day. In all probability he confounds this bird with the Iceland Falcon (*F. islandus*), which does occasionally straggle to Britain, although it is difficult to prove what it might do within the space of twenty-four hours.

THE MERLIN (*Falco æsalon*)

The Merlin, or Stone Hawk, is the smallest of the British falcons, rarely attaining a length of thirteen inches. But if it is small, it is also sturdy, and one of the boldest of its race, attacking birds that far exceed it in size and weight. It is a skimmer over the ground, and a hedgerow searcher rather than a soarer; it prefers finches to any other birds; but so rapid is its sweep, so determined its onset, and so certain its aim, that it will strike a partridge dead at one blow. In winter it haunts the coast regions and lower grounds, preying on snipe and other waders. Common throughout Europe and Asia, the Merlin breeds regularly in our moorland regions, from the Peak in Derbyshire to the Shetlands, and also in many parts of Wales and Ireland. A pair of birds will frequent the same district for years, and others of their kind will take care

not to make a home in the near vicinity. The nest at the best is but a hole in the ground, with perhaps a little moss and grass in it ; but like the falcon, the Merlin will sometimes appropriate an old nest. The eggs are dark reddish brown or purplish red.

THE KESTREL (*Cerchneis tinnunculus*)

The Kestrel, or Windhover, is of very general distribution in the Old World, and is the best known of the British hawks. It is frequently to be seen hovering in the air, balancing itself at a height of fifty feet, with its face to the wind. A lark sitting on its nest will be discerned with ease, but not even a field-mouse or lizard will escape the Kestrel's marvellous vision. As soon as the quarry is detected, the bird lowers its altitude and then drops like a bolt, snatching up its prey in its claws, and bearing it away to a perch to devour it ; insects it eats out of its claws while on the wing.

With any bird it is always difficult to lay down a hard and fast rule. It is often considered that the Kestrel only attacks birds when other food fails. In any case it will often snatch a bird-catcher's decoy bird, and it has been known to chase a sparrow through the window of a dwelling-house, so intent was it upon effecting a capture. On the other hand, a tame male Kestrel sat upon and hatched several eggs of the common fowl, and it only destroyed the chicks when some person irritated it.

The plumage of the Kestrel exhibits some elegant markings. The upper surface is a reddish brown, most of the feathers being tipped with black ; the head and nape are blue-grey ; there are dark streaks on the sides and wings ; and the tail is bluish grey with a black band near its extremity. Though the Kestrel's flight is so graceful, it is not sufficiently swift to capture birds on the wing, in addition to which it has less energy than many of its kind. Next to mice, the bird's diet consists largely of insects, especially dragon-flies. Thus in the autumn a great part of the Kestrel's ordinary food begins to fail it, and definite signs of winter is the signal for many of the species to leave our shores for a season.

THE COMMON KITE (*Milvus ictinus*)

The Common, or Red, Kite is a bird of Europe and Northern Africa. In England a quite usual name for it is 'gled' or 'glead,' from the old Saxon word *glida*, referring to the bird's peculiar and graceful mode of flight, its gliding along on pinions outspread, but motionless.

The Kite is a positive scourge to the poultry keeper. The appearance of the bird, wheeling about with eyes intent upon the young broods in the farm-yard, was sufficient for the full-grown poultry to set up a scream of execration, while the anxious farmer prepared his gun to give the intruder its deserts. Perceiving how matters

stood, the Kite would circle off out of danger, only to return again when the excitement had simmered down. Presently the bird would sweep from aloft, scattering the astonished broods, from whose number one would be borne away screaming in the Kite's



COMMON KITE

claws. If once successful, the bird would repeat the visit, so that often brood after brood was thinned before the despoiler's outstretched wings decorated the barn door. Most British farmers to-day would fail to recognise the Kite, but on the Continent the poultry rearer knows the foe only too well.

The Kite is two feet in length. Its general colour is reddish brown, relieved by lighter and darker shades, together with chestnut, black, white, and grey on other

parts of its body. The bird constructs a nest of its own in a tall tree; it consists of sticks, bones, wool, rags, etc. The eggs are a dull white, with blotches and spots of rusty brown. The young ones not only remain in the nest a long time, but they are extremely voracious; and it is at this period that the parent birds work havoc in the poultry yards. At other times the Kite is rather a cowardly bird, and its diet consists largely of small mammals, reptiles, insects, fish, and always carrion if the opportunity offer.

THE SPARROW HAWK (*Accipiter nisus*)

The Sparrow Hawk, generally distributed over Europe, is fairly common in many woodland districts throughout the British Isles. The upper parts of the plumage are dark bluish grey; under parts, reddish white. For a bird only a foot in length it is a most rapacious creature, preying particularly on small birds, partridges, pheasants, moles, mice, insects, etc. When it has a hungry brood to feed it is the terror of the farm-yard, surpassing either the kestrel or the kite;

but many agriculturists forgive it for killing a few chickens, because of the good it does in assisting to keep down the numbers of the common sparrow. In pursuit of its prey it displays the greatest pertinacity, skimming along only a few feet above the ground. Before the invention of sporting firearms the Sparrow Hawk, when properly trained, rendered useful service to the falconer, for it will fly at almost any other inhabitant of the air, no matter what its size. When taken young it is easily tamed, and it is astonishing how differently birds in captivity comport themselves. One has been known to fly in terror before wagtails, and would allow saucy tomtits to charge at it, and cause it to leave its saucer of food, whereas another would stand no such interference from either cats or dogs.

The Sparrow Hawk's nest is composed of sticks lined with twigs, but often it selects the old home of a crow or wood-pigeon; and it usually retains the same nest for several years. The eggs are pale bluish white, boldly blotched with dark brown.



SPARROW HAWK

The Common Goshawk (*Astur palumbarius*) is one of a rather numerous group. It is a handsome bird that was once used largely in falconry, especially in the hunting of ground game. Its methods remind one much of the cheetah, for, being slow on the wing, it steals upon its quarry to make an unexpected pounce upon it.

The Buzzards form another important group. The Common Buzzard (*Buteo vulgaris*) is still of frequent occurrence in Wales, the Lake District, and remote parts of Scotland; but it finds it increasingly difficult to maintain a footing in its old haunts. It preys chiefly on young hares and rabbits.

The Harriers are long, slim birds, with rather distinctive facial ruffs. Montague's Harrier (*Circus cineraceus*) is gradually getting scarcer in the British Isles, for, although every year a few pairs arrive from the Continent in April, for the purpose of nesting in Wales or the southern counties, they are seldom allowed to rear their young. The male bird is slaty grey in colour. The Hen

Harrier (*C. cyaneus*), too, now rarely breeds with us, except in the wildest regions of Scotland and Ireland. Both birds are ground builders and prey upon small mammals, birds, and reptiles.

THE EAGLES

The Eagles, though not the largest, are the most powerful and the most destructive of the Accipitrines; and their whole air and appearance are in strict keeping with their character. With undimmed gaze, the eye will meet without blinking the full glare of the midday sun; the flight, though in some cases lethargic, is soaring and majestic, and the fatal swoop impetuous and irresistible. Every attitude marks power and resolution, and when in the calmest posture of repose the eye betrays the burning fires within. From Biblical times the Eagle has ever been the symbol of courage, strength, and dignity, and the recognised monarch of all the birds. Like the lion among the quadrupeds, it was supposed to disdain all petty plunder, and when it dined off its prey left plentiful fragments for the humbler of its subjects; but in reality the Eagle does not always bear out these lofty conceptions of its character.

The figure of an Eagle was emblazoned on the banners of the ancient kings of Babylon and Persia; the Romans used it as the ensign of the legion, and were also accustomed to set free a living bird from the funeral pile of a dead emperor, probably symbolising the departure of the deceased monarch's soul to other realms. In later times the French, Germans, Russians, and the people of the United States have adopted the Eagle as their national device, just as the lion is the emblem of the British.

Several well-known and typical predaceous birds must be dismissed in rather haphazard order. The Harpy Eagle (*Thrasaëtus harpyia*) of Central and South America, is one of the fiercest and most powerful of the Accipitrines. In its native regions it is known as the "Winged Wolf," preying largely on fawns of all kinds, monkeys, even fairly sized pigs, etc. The Imperial Eagle (*Aquila heliaca*), which ranges from the south-east of Europe to China, is commonly notable for its majestic flight and its fearlessness of man. Mr. Hume, however, speaking from knowledge of the bird in India, says that "it is no better than a great, hulking kite," backing up his opinion with the statement that he has plundered a nest with less trouble than a shrike would have given him. He has also observed a couple of crows give one of the imperial birds a sound thrashing.

The Bald, or White-headed, Sea-Eagle (*Haliaëtus leucocephalus*) of North America is so named on account of its snow-white head and neck. It is exceedingly fond of fish, but is no great fisher; and it finds that the easiest method of obtaining the desired dainty



PLATE XVII

Osprey
Kestrel

Golden Eagle
Honey Buzzard

is to rob the osprey and other birds that are better qualified than itself for the sport. It is, however, by no means averse to carrion, and has been seen seated regally upon a dead horse, keeping at a distance a horde of vultures which were collected round the carcass.

The White-tailed Sea-Eagle (*H. albicilla*) is garbed principally in brown except for its white tail. The male bird is twenty-eight inches in length, and the female six inches longer, or about the same size as the golden eagle. Its home is in Northern Europe and Asia, and in regions as far apart and dissimilar as North-West India and Greenland. It formerly visited the British Isles frequently, but is now rare, except in the Shetlands and Hebrides. The bird feeds largely upon fish and water-fowl, it despoils the osprey of its prey, and it is always ready for a meal upon carrion. Sometimes it will gorge itself on seaside garbage and offal to such an extent that, being unable to rise, a boy has killed it with a stick.



WHITE-TAILED SEA-EAGLE

THE GOLDEN EAGLE (*Aquila chrysaëtus*)

The Golden Eagle is the largest and noblest of the European birds of prey. Its range is very wide, for it includes all Northern Asia, as well as portions of China and India; large numbers of the bird winter in Palestine; it is also known in Arabia, Egypt, and Algeria, and most naturalists agree that the Canadian Eagle is of the same species.

The Golden Eagle is the generally accepted 'King of Birds,' although during recent years much has been learnt to detract

from its character for boldness and fierceness. The bird, feathered to its toes, is of a rich blackish-brown colour ; the feathers on the head and the back of the neck being of a golden shade, and hence the name ' Golden Eagle ' ; the tail is a deep grey, barred and tipped with bands of blackish brown ; the wings are large, spreading, and rather rounded. A full-grown bird weighs about sixteen pounds, but the wings of nine feet expanse and breadth of tail make it seem larger.

This magnificent member of the eagle tribe was once plentiful in the British Isles, but it has long been driven into the Scottish islands or the more remote mountains of Ireland ; and even there it is allowed to exist chiefly upon sufferance, largely out of a sentimental desire for the king of birds not to become quite extinct in this country. Now and then a couple of birds will make an incursion into cultivated tracts, but they rarely escape the gun. The normal food of the Eagle in the British Isles consists of hares, rabbits, and similar animals, young deer, game birds, etc. But, when its nest is near human habitations, it is apt to supply its family with lambs, young pigs, and poultry, so that it is rather an expensive neighbour, and must be either captured or shot.

The nest of the Golden Eagle is always placed upon some lofty spot, mostly a nearly inaccessible ledge of rock. The nest itself is nothing but a quantity of sticks thrown together without any attempt at weaving them, but a hollow in them is lined with roots, grass, moss, heather, seaweed, etc. The nest is repaired year after year, until it assumes quite large dimensions, often as much as a couple of loads of material. Only two or three eggs are laid ; they are dirty white in colour with rusty brown patches. The immediate neighbourhood of a nest is an evil-smelling place that quite defies description, for refuse food is allowed to putrefy even in the very nest.

Many of the daring feats attributed to the Golden Eagle, doubtless, have little foundation in fact ; but the following authentic incidents throw some light upon the bird's capabilities. A youth, named Macdougall, residing near Oban in Argyleshire, had rather a strenuous encounter with an Eagle, when out one morning shooting rock pigeons. As the bird came floating over the brow of a precipice, Macdougall fired, and the Eagle fell to the ground with a broken wing. Desiring to capture it alive, the youth sought to master it with his hands, but got them so dreadfully lacerated that he was forced to desist. He next set his terrier dog upon it, which was well accustomed to fight with badgers and otters, but one clutch of the Eagle was sufficient to send the dog to a safe distance. Giving up all idea of capturing the bird alive, Macdougall attacked it with the butt end of his gun, but the Eagle was not laid low until it had received a dozen stout blows.

More than a few instances have been recorded of children being

seized by Eagles and carried off as food for their young. Upon one occasion a boy of seven was attacked in a harvest field, but he snatched up a sickle, and, fortunately, dealt the bird a fatal blow at the first attempt. At Norderhouse, in Norway, a two-year-old boy was snatched up in sight of his parents, and to their inexpressible grief, was carried away out of their sight.

THE MONKEY-EATING EAGLE (*Pithecophaga jefferyi*)

In 1896 the late Mr. J. Whitehead, one of our most successful collectors of birds and beasts, discovered in the Philippine Islands an Eagle that was quite new to science. He managed to kill a specimen, and examination showed that for size and fierceness the bird was second only to the Harpy Eagle. Its rounded wings indicated that it was not a migrant, but a forest dweller; and it was found that its food consisted chiefly of monkeys, which are absolutely helpless when once in the clutches of the huge talons. During the next few years several skins of the Monkey-eating Eagle found their way to various European museums, but in 1909 Mr. Willoughby Lowe performed the remarkable feat of capturing a living specimen, which, in due course, arrived at the Zoological Society's Gardens, London.

Although it was impossible to provide the captive with the diet which it preferred, hopes were entertained that some other kind of animal food would satisfy its fastidious taste. Nevertheless, the Monkey-eating Eagle died at the end of six months. Its carcase was placed in the hands of Mr. Rowland Ward, the eminent taxidermist, who extracted every bone of the body, even to the claws, without



MONKEY-EATING EAGLE

injuring the skin, or the covering of the powerful legs and feet. The skeleton was cleaned, bleached, and put together, and placed by the side of the stuffed skin in a large glass case in the British Natural History Museum, where it remains one of the most unique exhibits in any of the world's collections. Mr. Berridge's excellent photograph, taken immediately after the bird's arrival in this country, shows the chief characteristics of this interesting accipitrine, particularly the terrible talons, and the huge, fierce beak, which is marked by great depth and lateral compression.

FAMILY VULTURIDÆ THE VULTURES

The true Vultures are the hyænas of the feathered world, living chiefly on carrion, and not animals killed by themselves, for which their rather short and blunt claws would render but poor service. Their distinguishing feature is the bare condition of the head and neck, which are naked except for a sprinkling of down. Whether the marvellous quickness with which Vultures discover a dead animal is due to specially keen sight or smell has caused much discussion among naturalists, and various experiments have been made to settle the point. The balance of opinion now is that these scavengers rely principally upon their keenness of vision; but, nevertheless, when a dead hog was purposely hidden under canes and briars, Vultures were seen sailing in all directions over the spot, evidently attracted by the scent, but unable to verify the position of the prey by the eyes. There are many species of Vulture, but two or three of them will serve to display their chief habits.

The Egyptian Vulture (*Neophron percnopterus*), or Pharaoh's Chicken, has a wide habitat, ranging from Southern Europe and Egypt to the Cape and Persia and India; it is one of the most typical members of the family, and is additionally interesting because it has occasionally visited the British Isles. Except for the dark brown quill feathers, the bird is nearly white; hence the name 'White Crow,' which is often bestowed upon it in South Africa, and it may be remarked that the bird is only twenty-five inches in length, or about equal in size to the raven. In Egypt and other countries the Vulture is protected by law. Secure under its human protection, the bird walks fearlessly about the streets of its native land, and, in common with the pariah dogs, soon clears away refuse substances that are thrown into the open streets.

The Griffon Vulture (*Gyps fulvus*) is at least a foot longer than the last-named; it is a native of Spain and North-Eastern Africa, India, and many regions between. It is a high-roving bird, ever on the look out for a dead or dying animal. If it be attacked while it is freshly gorged, it will eject the load of food by a spasmodic effort before taking to flight.

THE LAMMERGEIER (*Gypaëtus barbatus*)

The Lammergeier is one of two very large species of bearded Vulture, one an African bird, while the typical form ranges from the south of Europe to the Himalaya. Unlike the true Vultures, this bird has its head covered with feathers, and possesses a beard of bristles, for the first of which features the Lammergeier is sometimes included with the eagles. In most of its habits, however, it is a real Vulture, for though it may under pressure of severe hunger attack living animals, its main food consists of carrion.

The Lammergeier is a mountain bird, and was formerly very common in the Swiss Alps. A male bird was killed in the year 1862, but its mate was not captured until twenty-five years later. No other specimen has since been secured from Switzerland, but the bird is still to be found in Spain and Italy. This magnificent bird, which attains a length of three and a half feet, often figures in romantic stories of the abduction of children, but the creature's weak feet are totally against any such achievement. It is not known to carry off lambs, fowls, or tame pigeons, not even when the last-named are decoy birds for hawks ; and if for no other reason, we are safe in classing it with the Vultures rather than the Falconidæ. In order to obtain the marrow from bones the Egyptian Vulture will carry them high up into the air, and drop them upon the rocks beneath ; the Lammergeier adopts the same plan, and treats land tortoises in a similar manner, which gains for it the name ' Bone-breaker.' The nest is a huge platform of sticks and



LAMMERGEIER

twigs on a mountain ledge, often at an elevation of five thousand feet ; usually only one egg is laid.

FAMILY : SERPENTARIIDÆ

THE SECRETARY-BIRD (*Serpentarius secretarius*)

This remarkable bird extends from Abyssinia to the south of Africa, and in the west it is found in Senegambia. Owing to its great length of leg, which gives it a height of over four feet, one



SECRETARY-BIRD

would feel disposed to class it with the cranes, but there is no mistaking the accipitrine beak, even if there were no other more technical anatomical resemblances. The bird derives its name from the tufts of feathers at the back of the head, giving a fanciful likeness to pens stuck behind the ear. In colour the plumage is chiefly pearly grey and black.

Though the Secretary-Bird can fly strongly, soaring in the fashion of the vultures, it spends much of its time on the ground ; when it is chased on horse-back it runs instead

of having recourse to its wings, which would remove it speedily out of danger, and even a wounded bird can travel as fast as a man can run. The chief interest in the bird, however, centres in its food. Le Vaillant assured us that he dissected the crop of one specimen, which contained eleven large lizards, three serpents, each a yard in length, eleven small tortoises, and a great quantity of locusts and other insects. On the other hand, some close observers maintained that the Secretary avoided coming into contact with even small snakes. There is now no doubt that the bird feeds almost

exclusively on reptiles, poisonous snakes amongst them, in consequence of which it is strictly protected by law in various regions. It kills a snake by first kicking it with its powerful feet, shielding its body with its outstretched wings, and sometimes it carries its prey aloft, and drops it disabled on the ground. One of the most interesting sights I ever witnessed was a Secretary-Bird in the Zoo engaging in marvellous evolutions with a piece of paper, that was blowing about its enclosure. The whole performance gave an excellent idea of the bird's capabilities when engaged in a serious, instead of a mimic, contest.

FAMILY CATHARTIDÆ

THE TURKEY-VULTURES

It is purely on account of anatomical differences that these American birds of prey are separated from the Vultures of the Old World, with which they have many habits strictly in common.

The Californian Vulture (*Pseudogryphus californianus*) "while on the wing looks more than the peer of any of our birds, the golden eagle not excepted"; in expanse of wing it may even exceed the condor itself; and its strength may be judged by four of the birds having been seen to drag the carcass of a young bear, nearly a hundredweight, a distance of two hundred yards.

The King Vulture (*Gypagus papa*) is remarkable for its brilliantly coloured bare face, while much of its upper and lower plumage is cream colour, against which the black of the greater wing coverts and tail stands out in bold relief. There are other species well worth notice, such as the Black Turkey-Vulture (*Catharistes urubu*), which in some towns of Central America fearlessly haunts the streets in search of carrion; but all the members of the family suffer in comparison with the succeeding bird.

The Condor (*Sarcorhamphus gryphus*) of the Andes is the largest of all flying birds. In length it is about four feet, and, being stoutly built, it is of immense weight. It was once supposed to have a wing expanse of twenty feet, rivalling the fabulous roc, whereas the spread is but nine or ten feet. Darwin afforded us much interesting information concerning the Condors, which he observed near Santa Cruz:—

"It was a grand spectacle to see between twenty and thirty of these great birds start heavily from their resting-place, and wheel away in majestic circles. Having gorged themselves with carrion on the plains below, they retire to their favourite ledges to digest their food. From these facts the Condor must, to a certain degree, be considered as a gregarious bird. In this part of the country they live altogether on the guanacos which have died a natural death,

or, as more commonly happens, have been killed by the pumas. Besides feeding on carrion, the Condors frequently attack young goats and lambs, and the shepherd dogs are trained, whenever



CONDOR

they pass over, to run out, and looking upwards, to bark violently." In some regions the natives lasso the birds when they are so gorged that they have difficulty in flying.

ORDER : STEGANOPODES

THE COMORANT GROUP

In one respect the birds in this order differ from all others, namely, all four toes are connected by webs. They are chiefly long-bodied, short-legged birds, but the beak and wings differ considerably in length in the various families. All of them are carnivorous in taste, fish being the food preferred. The method of capturing finny prey is variable; some simply fish as they swim, by thrusting their necks down into the water, others plunge from a height or even pursue their prey under the water. The best-known birds are the Cormorants and Darters (Family Phalacrocoracidæ), the Gannets (Sulidæ), and the Pelicans (Pelecanidæ).

THE CORMORANT (*Phalacrocorax carbo*)

The Common Cormorant is of almost world-wide range with the exception of Australasia. It is three feet in length, chiefly black with green reflections, and during the breeding season the male wears ornamental white plumes on its head. It is common on all our rocky coasts, frequently ascending tidal rivers, and it is a voracious devourer of fish, which it chases under water. Sometimes half an hour elapses before the bird can accommodate a large eel in its stomach, the fish constantly retrograding upwards from its dismal sepulchre, but at length, worn out with continual struggling, it is disposed of successfully. Notwithstanding its fully webbed feet, the Cormorant is a good percher, and in many parts of the world roosts in trees regularly. Twenty years ago one was seen perched upon the top of St. Paul's Cathedral, doubtless taking a rest during a long flight from one coast to another.

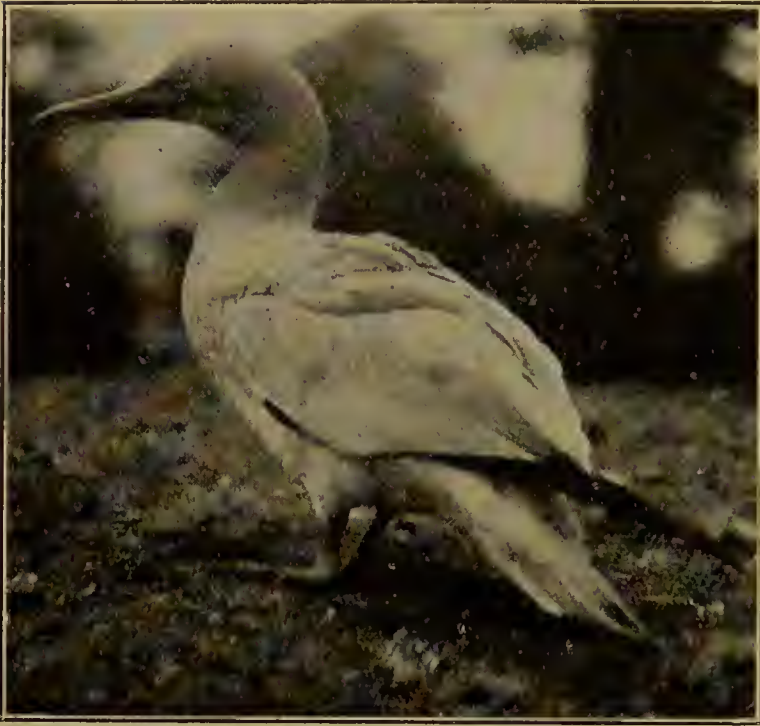
The Cormorant is easily tamed, and in the seventeenth century it was used in England to capture fish. The Chinese still systematically utilise the bird in this manner, fixing a ring round its neck to prevent it from swallowing its prize. Some of these trained birds will fish without a collar for their masters, and if a fish is unmanageable owing to its size, another bird will at once go to the assistance of its comrade. The Green Cormorant, or Shag (*P. graculus*), frequents the same localities. It is a smaller bird and rarely moves inland; but in all other respects its habits are similar to those of the common species.

The Darters have a longer neck, a flat, narrow head, and a straight and very pointed bill without the sharply deflected tip shown in the beak of the cormorant. The four species inhabit as many different continents, but are unknown in Europe. The Indian Darter (*Plotus melanogaster*) "is capable of moving for considerable distances under water, and usually swims with nothing but its head and neck exposed, though, when danger threatens, everything but its bill disappears, till it considers it has gone far enough to be perfectly safe." It transfixes a fish with lightning speed and unerring certainty, and when it rises to the surface, jerks the fish into the air, dexterously catches, and swallows it.

THE GANNET (*Sula bassana*)

The Gannet, or Solan Goose, is widely distributed throughout the Northern Hemisphere. It breeds on Lundy Island, and particularly on the Bass Rock at the entrance to the Firth of Forth; the nest of seaweed and grass is placed on a ledge of rock, and sometimes in a low tree. The plumage is white, except for buff on the head and neck and the black primaries. The bird feeds entirely on

fish, especially herrings, which it seizes by plunging with extraordinary force from a considerable height. The tapering bill, sharply pointed at the end, is of remarkable strength. The Gannet



GANNET

is sometimes captured by fastening a herring to a stout piece of wood, and floating it on the surface of the water. The bird plunges headlong with such velocity, that it is often killed outright by unexpected contact with the wood; even when a board has been sunk to a depth of six feet the bill has been driven firmly into the wood, and the bird's neck has been dislocated.

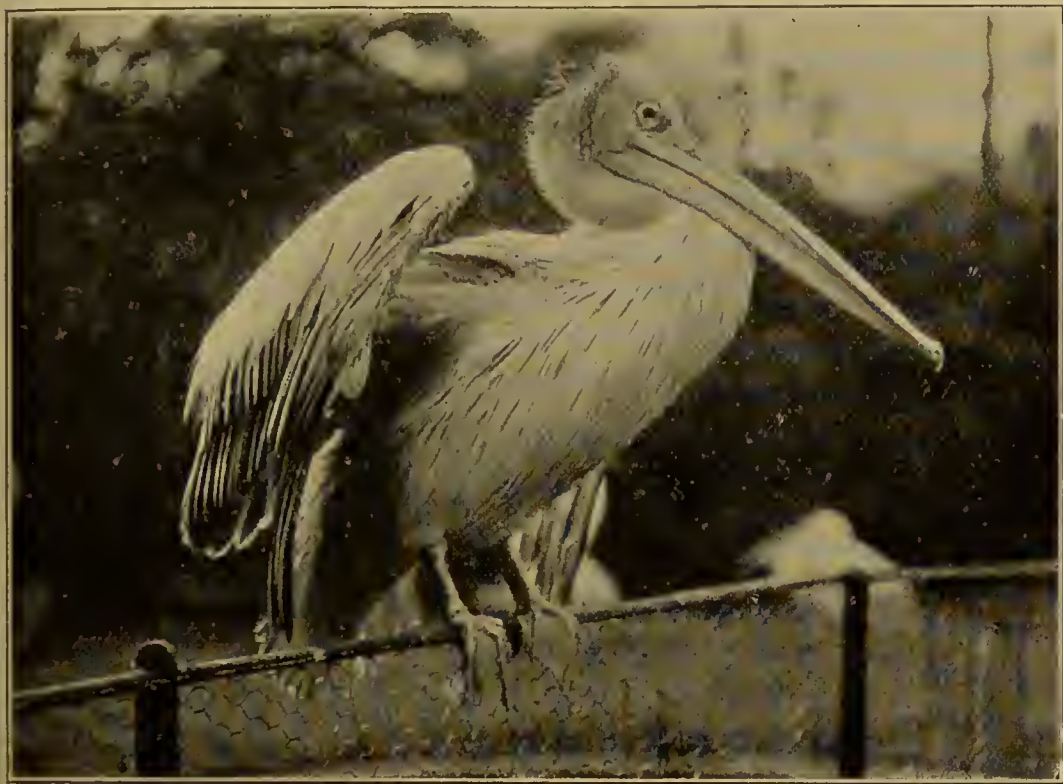
Though it is not generally offensive, in the spring of 1910 a Gannet attacked a man near Lyme Regis. So persistent was it, that it was only after a stern contest that the bird was killed with a heavy stick.

A Solan Goose measures three feet in length. Its flesh is coarse and fishy, but in some of our northern coast regions and islands the poorer classes rely upon it largely for food. At St. Kilda about twenty-five thousand of these birds are captured annually for their flesh, feathers, and oil, and as the population of the island is less than a hundred this sea-bird is of the utmost importance to the isolated people.

THE WHITE PELICAN (*Pelecanus onocrotalus*)

The White Pelican is common in many parts of Southern Europe and Northern Africa. In appearance its bill makes it one of the most extraordinary of all feathered creatures; it is long and flat, hooked at the tip, and the lower mandible is developed into a singular membranous pouch, which serves as a bag-net with which to scoop up the fish upon which it feeds. Most of the plumage is white, faintly tinged with rose colour; the primaries are black. The

upper mandible is reddish yellow, the pouched lower one is flesh colour. The bird is very gregarious, frequenting tidal rivers, lakes and swamps. Though it is ungainly in body and waddling in gait, it can fly strongly with its head drawn back between its shoulders, and the legs extended beneath the tail. The Pelican is a capable



PELICAN

diver, but, when fishing, a number of birds form a double or treble line, and drive the fish into the shallows, where their capture is an easy matter. Though the bird is five feet in extreme length, it perches on trees ; but it builds its nest of grasses upon the ground. When the parent bird feeds the young, it presses the pouch against its breast, and raises the lid, so that the young one can help itself. In all probability this action gave rise to the fable of the Pelican feeding its offspring with its own blood.

Two other birds of the order Steganopodes must be mentioned. The Frigate Bird, or Man-of-War Bird (family *Fregatidæ*), has immensely long wings, and in flight is, perhaps, superior to all other birds. Its peculiar *forte* is robbing other sea-birds of their prey, which, as it falls, is caught dexterously by the robber ; but when hungry the Frigate Bird does not hesitate to devour the smaller birds of its own species. The Tropic Bird (*Phaëthontidæ*) is powerful and rapid in flight. It can continue on the wing for whole days and nights ; sometimes it settles on the rigging of a vessel ; and it has

been seen resting on the back of a turtle sleeping on the surface of the water. The bird feeds chiefly on flying fish.

ORDER : ODONTOGLOSSI

FAMILY : PHÆNICOPTERIDÆ

THE FLAMINGO (*Phænicopterus roseus*)

The Common Flamingo is the best known of nearly a dozen species ; its range is from Southern Europe to the Cape, and eastwards to India. It is a spindle-legged bird, with a long and slender neck, and the beak is bent down sharply, so that when the head is stooped to the water, the upper mandible forms a spoon-like in-



FLAMINGOES

strument for feeding. The plumage is generally rosy white, with black wing quills and scarlet wing coverts. The bird frequents marshes, lakes, and mouths of rivers, very often in regions where miasmatic exhalations render it comparatively safe from disturbance by man. Only rarely does a bird straggle to Britain in the summer.

The nest is a conical structure of mud, and as the birds are very gregarious, their nests look like little islands rising above the surface of the water. At one time it was supposed that a pair of birds hatched their single egg by standing astride the nest ; but there is no doubt the sitting is accomplished in the ordinary manner, the legs being doubled up, and the long neck curled over the back. Mr. Hume says that in India it is a wonderful sight to see an

enormous flock of these birds at rest in the water, where they look "like a mass of faintly rosy snow. A rifle is fired, and then the exposure of the upper and under wing coverts turns the mass into a gigantic, brilliantly rosy scarf, waving to and fro in mighty folds, as it floats away."

ORDER : HERODIONES

HERONS, BITTERNS, AND STORKS

The birds in this order, though possessing certain anatomical features in common, show equally marked differences, that will be noted better if each group is taken separately. Nearly all of them, however, are of considerable size, and though mainly waders, they have long wings that are powerful in flight.

FAMILY : ARDEIDÆ

THE COMMON HERON (*Ardea cinerea*)

The Common, or Grey, Heron is the most familiar of this family of long-legged waders, with bills, long, straight, and pointed, and often serrated on the edges, or just the type specially adapted for capturing fish. Though from their structure they appear little fitted for an arboreal life, many of these birds build nests of sticks in trees, frequently in colonies; but from August to the breeding season they separate, to lead a rather solitary existence.

The Grey Heron is three feet or more in length. Its upper plumage is bluish grey; there is white on the forehead, neck, edges of the wings, and thighs; black on the sides of the breast and flanks; and it has a crest of bluish black, and lustrous white plumes hang from its neck. In olden times Heron plumes were considered ornaments only for the nobility. The bird has an insatiable appetite for fish, frogs, rats, and young water-fowl; the prey is impaled in a flash, as it stands stiff and motionless in the water until the moment is ripe for striking, and sometimes the sharp bill will transfix sparrows and martins as they fly past. When it was chased by trained falcons the bird very often bayoneted its foe, and got the upper hand in the contest.

The Great White Heron (*A. alba*), ranging over the greater part of the Old World, is a slightly larger bird; but the Little Egret (*Garzetta garzetta*) of Southern and South-eastern Europe is only about half the size. It is from these birds and several allied species, such as the Australian Plumed Egret (*Mesophoyx plumifera*), that are obtained the feathers known as 'Ospreys.' It is a saddening reflection that these beautiful plumes are only obtainable in the breeding season, and the capture of the parent bird means that the nestlings are left to starve.

In order to meet the demand for feathered millinery many ornamental birds are becoming increasingly rare. In the case of



WHITE HERON

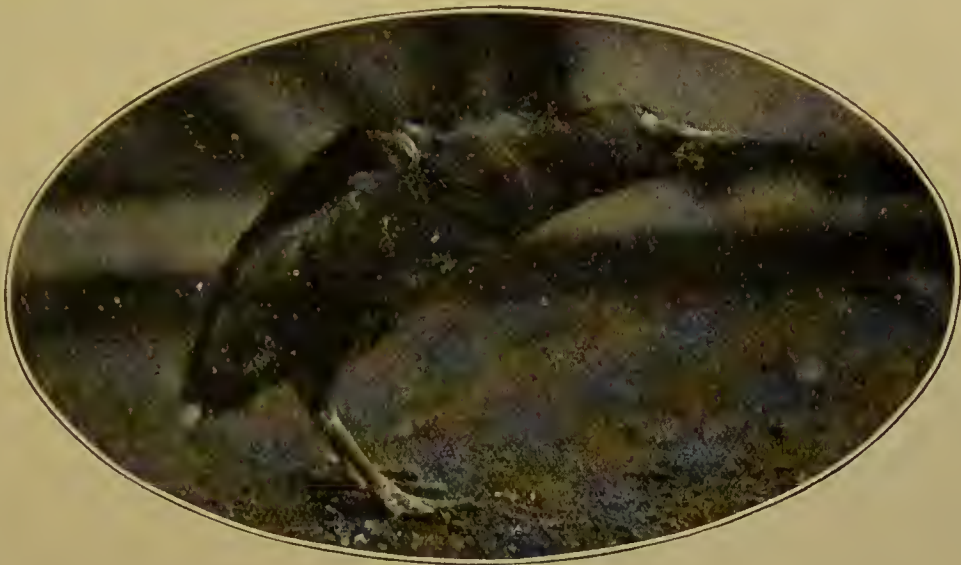
the ostrich the plumes are obtainable without destroying the bird, but in most cases actual skins are transferred to fashionable hats and bonnets, not even the tiny hummingbird's brilliant head and breast escaping. Notwithstanding continual outcries by bird-lovers, the slaughter goes on practically unchecked, the bird-skin importer often smuggling his products into the country in falsely labelled cases. Quite recently it was ascertained that six cases of supposed cowhair from Calcutta really contained the skins of six thousand four hundred green parrots, and within eight weeks

twenty-three similar cases had arrived from India.

THE BITTERNS

The Common Bittern (*Botaurus stellaris*) extends over Europe as far north as the Gulf of Finland, across Asia to Japan, and it is also found in Africa in various swampy regions that suit its habits. It is about twenty-eight inches in length; it is clothed chiefly in yellowish and rusty red, spotted and streaked with darker shades. Although it was formerly a common bird in our country, the draining of many swamps and reed beds has caused it to become only a very rare visitor, and whenever its booming, sepulchral cry is heard in the Fens, it is sufficiently interesting for immediate comment in the press. When falconry was in vogue the Bittern gave excellent sport, and was by no means an easy prey; indeed, when the falcon brought the quarry to earth, the falconer immediately ran up to secure its head, or the falcon was likely to suffer severely from the rapid, vicious darts of the wounded bird.

The Little Bittern (*Ardetta minuta*), only about a foot in length, is one of the smallest members of the Heron group ; and like its bigger relative is now merely a casual visitor to Britain. In flight



LITTLE BITTERN

the Bitterns are slow and rather laboured, but they can run and climb among aquatic plants with the greatest celerity. Frogs, fish, and water insects form the major part of their food.

FAMILY : CICONIIDÆ
THE STORKS

The White Stork (*Ciconia alba*) is the typical bird of the family, ranging over most of Europe, Northern Africa, and extending eastwards to India. It is a migratory bird, and is only a summer visitor to Europe ; and unlike most migrants it performs its journeys by day. In Jeremiah we are told that "the stork in the heaven knoweth her appointed times," and it reaches Palestine in March, and Holland in April, coming in both instances from Africa. The bird is three and a half feet in length ; it is chiefly white, except for the black scapulars and wings ; the feet and bill are red. Its food consists largely of rats, mice, and frogs, for which reason it is strictly protected in Holland, the land of dykes and sea-walls ; it is encouraged to build in the towns, and often the mass of sticks that forms the nest is found on the tops of chimneys, pillars, etc. A visitor to Constantinople remarks that in that city the bird has become more than usually staid and solemn, as becomes the Oriental character ; and it vied with the pariah dog in clearing the streets of offal, etc. Apart from its usefulness, the Stork is often accounted almost a sacred bird ; according to a Swedish legend it received its name from flying round the cross at the crucifixion,

crying Styrka ! styrka ! (Strengthen ! strengthen !) Unfortunately, the accurate naturalist must demolish the fanciful notion, for the Stork is practically voiceless, capable of making no sound, except that caused by the rapid clattering of its mandibles.

Of the score of remaining species, the Adjutant (*Leptoptilus dubius*) of India is the largest and ugliest of the Storks. It gains its military title from its measured walk, and also because it is in



MARABOU STORK

the habit of frequenting military compounds in India, where it is under the protection of the law on account of its utility as a scavenger. Nothing comes amiss to the enormous four-sided beak, and the bird will join vultures and contrive to get more than its fair share of some foul repast. With its almost bare head, thick, naked neck, and pendulous pouch on the throat, this giant Stork is almost repulsive in appearance, but its under-tail coverts are beautifully soft, providing the feathers known as 'Marabou,' which are so greatly esteemed for millinery purposes. The Adjutant is easily tamed, and often becomes quite troublesome in its familiarity. One bird, which was allowed the run of a house, more than once snatched a boiled fowl off the table, and bolted it on the spot.

The bird illustrated is the African Marabou (*Leptoptilus crumeniferus*).

Its back is metallic green ; its underparts are white ; the wing and tail are dull black ; and the outer webs of the greater wing coverts are edged with white. The reddish, flesh-coloured head crowns a bird that often exceeds five feet in height.

FAMILY : PLATALEIDÆ

THE SACRED IBIS (*Ibis æthiopica*)

The Sacred Ibis is three feet in length, and has a long curved bill, quite unlike that of the preceding birds. It is chiefly silvery white in colour, the feathers being glossy and closely set, except for some black secondaries, which are longer, and hang gracefully over the wings and tail. This bird figures largely on the hieroglyphs of ancient Egypt, where it was a capital offence to kill 'Father John,' as it was called. It was considered to be an incarnation of the god Thoth; its white plumage symbolised the light of the sun, and its naked black neck, the shadow of the moon, and its feathers alone were supposed to scare, if not kill, the crocodile. The Ibis is now unknown in Egypt, and it is doubtful if it ever existed there except in a semi-domesticated state; but it inhabits Nubia, the Sudan and Abyssinia, and ranges southwards almost to the Cape.

The Black Ibis (*Geronticus papillosus*) of India, and the Glossy Ibis (*Falcinellus igneus*), a reddish-brown bird of very wide distribution, call for no particular comment, except to say that the latter has occasionally visited the British Isles; but the finest of the family Ibisidæ, to which these birds are sometimes referred, is the Scarlet Ibis (*Guara rubra*) of Central and South America, glowing scarlet in colour, only relieved by a few patches of black.

The White Spoonbill (*Platalea leucorodia*) is found in many parts of Europe, continental Asia, except the north, and in Northern Africa. It is migratory, and two or three centuries ago regularly nested in heronries in Norfolk and Suffolk. Even nowadays, after the reclamation of much of our swamp land, the Spoonbill is more than a casual visitor to East Anglia, and it is sometimes seen on the south coast. The distinguishing feature of the bird is



SPOONBILL

the strange, spoon-like extremity of its bill, which is about eight inches in length, much flattened and channelled at its base. In some countries the inhabitants scrape and polish the bill and actually use it as a spoon, not infrequently setting it in silver. Mr. Yarrell in his *British Birds* observes that apart from the singular conformation of the bill, the species is remarkable for "being one of the very few which have been found to possess no true muscles of the organ of voice; and no modulation of a single tone appears to be possessed by the bird." The Spoonbill is a typical wader in its habits; it frequents swamps and lakes, and searches the pools along the seashore, where the tide has left shrimps, crabs, etc., but like most birds in the order Herodiones, it also feeds upon all kinds of aquatic herbage.

ORDER: ANSERES

FAMILY: ANATIDÆ

THE DUCK TRIBE

The order Anseres comprises more than a hundred and fifty species of widely distributed birds, of which the Duck, Goose and Swan are familiar and quite typical. Except in the case of one bird, the three front toes are completely webbed; the plumage is dense and practically impervious to water. Most birds have an oil gland situated at the root of the tail, from which they press out a drop of oil with which to lubricate and polish their feathers; and in the case of aquatic birds the feathers are really varnished with the oily fluid to throw off the water. On land the gait of some of these birds is constrained and awkward, but their bodies are ovate in shape, and they swim with ease and grace, and all of them are strong on the wing, flying at a great height. The bill is flattened and rounded, the edges of the upper mandibles are furnished with a series of upright laminae or plates; and the tongue is fleshy and extremely sensitive. When any one of these aquatic birds takes up a mouthful of mud, weeds, etc., the water drains from the laminated mandibles as from a sieve. On the whole the Ducks are omnivorous; but in the case of the Mergansers, which are almost solely fish eaters, the laminae of the mandibles are recurved for the firm holding of finny creatures; and in the Geese the plates are hardened for the purpose of cutting grass, upon which they largely feed. Most of the tribe are very gregarious, and are in the habit of migrating northwards for the breeding season. Sometimes it is attempted to separate the members of the order into several distinct families, but the most approved plan is to account them as all belonging to the family Anatidæ. There are various sub-families such as the Geese (*Anser*), Swans (*Cygnus*), and the true Ducks (*Anas*); but there are other sub-families of Ducks that run into each other in a manner too confusing to be dealt with in brief.

THE GEESE

There is no need to describe the common Goose which we rear in vast numbers for table use, yet it is only the domesticated form of the Grey Lag Goose (*Anser cinereus*), which formerly bred largely in the Fens and adjoining districts. It is about thirty-four inches in length, and attains a weight of nine or ten pounds; its upper plumage is ashy brown mixed with greyish white, and the underparts are lighter. Its habitat extends over all Europe and Central and Northern Asia, where it winters in India and China. Our native birds now breed only in the north of Scotland, from whence they pass southwards in autumn. Remote marshes and swamps are their favourite resorts, where they



EGYPTIAN GOOSE

live largely on aquatic plants; but they visit cultivated lands for grass, and the shoots of young corn. They are most wary birds, and so difficult of approach that 'A Wild Goose chase' has passed into a proverb. They are very gregarious, flying at a great height, the figure assumed by the flock usually being the letter V; the leader occupies the point until it is fatigued, when it retires to the rear of one of the lines, the next bird in station taking the lead.

The Bean Goose (*A. segetum*) is a duskier bird, its plumage being varying shades of darker brown. It is one of our common winter visitors, coming to us from the tundras of the north-east of Russia. Many of the birds, however, remain to breed in the Lake District, the north of Scotland, the Hebrides, etc.

The Brent Goose (*Bernicla brenta*) breeds in the Arctic regions and winters in the British Isles and similar latitudes on the Continent. It is dingy on the upper parts, and white on the lower;

the head, neck, breast, quills, and tail are black, and there is a patch of white on each side of the neck. The Brent, weighing only about four and a quarter pounds, is one of the smallest of the Geese visiting our shores ; it does not resort inland, but is a marine bird, preferring to search coastal mud-flats and sandbanks for marine plants, etc. The Pink-footed, White-fronted, and Bernicle Goose are other winter visitors ; but the Egyptian Goose (*Chenalopex ægyptiaca*), which is sometimes recorded among our migrants, certainly does not journey to us from the other side of the Mediterranean. Any such bird will be found to be only a wanderer from the ornamental water-fowl of some inland lake. They are usually confined to their quarters by having their flight feathers cut ; but after moulting they sometimes fly away, and are shot as *rareæ aves*.

THE SWANS

The Swan, with its long neck, plumage thick and close, and wings long and ample, is at the head of the Anatidæ for size, grace, and elegance. Gliding over the water with arched neck, proudly expanding the plumes of its wings, like sails, to catch the breeze, no bird is more calculated to arrest the attention and enlist the admiration of the observer. Our common, partially domesticated bird is the Mute Swan (*Cygnus olor*), so called from its silent habits ; it



MUTE SWANS

enjoys the protection of the law to a great extent, and heavy penalties can be enforced against persons killing one without a legal right. Its food is chiefly the seeds of water plants, molluscs, insects, etc. Making its nest in the midst of reeds and osiers, often on a small island, the mother bird is very watchful over her

eggs or young, and, with her mate, fiercely assaults any intruder ; and as the bird is five feet long and has powerful wings, persons have suffered from broken arms in such an encounter. The young birds are called cygnets ; their plumage is greyish brown until the third year, when they acquire their white robes in all their purity. The Mute Swan is found all over the kingdom, and is particularly abundant on the Thames ; between London Bridge and Henley there were no less than four hundred and fifty birds in 1910. At Abbotsbury, near Weymouth, is a swannery, the only one in England, where there were over a thousand birds in the same year. The Wild Mute Swan breeds in various regions, such as the south of Sweden, Germany, Austria, Russia, and in parts of Central Asia, the birds wintering in Northern Africa and India, only a very few finding their way from Sweden to the British Isles.

The Whooper, or Whistling, Swan (*C. musicus*) has its headquarters in Siberia, Lapland, Iceland, and Hudson's Bay ; the Lapland birds migrate to Britain in winter, and a few even nest in the Orkneys. Bewick's Swan (*C. bewicki*) breeds largely in the White Sea regions, but large numbers of the species winter with us from December to February. Flocks of thirty and forty are fairly common, and as many as eight hundred have been seen together in County Kerry, Ireland.

The Black Swan (*Chenopsis atrata*) is the Australian member of the Swan sub-family. It is a popular bird on many of the ornamental lakes of our public parks, where it may often be seen with its cygnets even in the middle of winter. Its black plumes are a great contrast to the snowy white mantles of the foregoing species.

THE DUCKS

The Wild Duck, or Mallard (*Anas boscas*), is the best example of what are termed the freshwater, non-diving Ducks, and it is from this species that are descended all our common domesticated varieties, not even excepting the famous Aylesburys, large in size and garbed completely in white. The Mallard is one of the handsomest of its tribe, and, doubtless, would be more admired if it were only an occasional visitor, instead of being a permanent resident, joined by great numbers from the Continent during the colder months. The most noticeable points of the drake's colouring are the rich, glossy green of the head and neck, the snow-white collar, the chestnut breast, and the velvety-black, curly tail feathers. Our native birds have greatly decreased in numbers, not only on account of the draining of marshy districts, but also because of the reckless manner in which fowlers have taken both old and young. The food consists chiefly of aquatic insects, frogs, fish-spawn, but not fish as a rule. The nest is generally placed among rushes and sedges, and the pale green eggs number eleven or twelve.

Occasionally the nest is built, and the eggs are hatched, in a tree, from which in due course the young drop to the ground.

Various other species of Duck are beautifully plumaged, but practically all of them can be distinguished by the colour of the head and neck. The Sheld-duck (*Tadorna cornuta*), a larger but equally handsome bird, is almost a marine species, frequenting



VARIEGATED SHELD-DUCKS

sea-coasts, estuaries, and mud-flats, where molluscs, crustacea, etc., are to be found. The distinguishing features of the bird are its black head and throat, white lower neck, and a broad band of chestnut from the shoulders, and meeting on the breast. The nest, consisting of bents lined with down from the breast of the female, is often built inside a rabbit burrow, well within the entrance, where from seven to twelve greenish-white eggs are laid.

The Shoveler (*Spatula clypeata*) is so called because its bill is particularly broad at the tip, the upper mandible overhanging the lower one. Its head and neck are glossy green ; breast, pure white ; flanks, chestnut. It breeds upon many of our inland lakes and marshes, but not to so great an extent as formerly, when swamp land was more extensive. It nests in long grass or heather ; the eggs, eight to fourteen, are greenish buff in colour. The flesh of this Duck is considered equal to the famous Canvas-backed Duck (*Fuligula valisneria*) of America, which makes it still more a matter of regret that it does not visit us in autumn in greater numbers.

The Teal (*Querquedula crecca*) is the smallest of our British Ducks, and by no means the least pretty ; the head and neck in particular are bright chestnut, with a broad green band enclosing the eye. The bird breeds in nearly all parts of Great Britain and Ireland,

and large numbers come in the winter months from abroad ; its flesh is particularly delicate, and is in great request. The yellowish-white eggs sometimes number fourteen.

The Wigeon (*Mareca penelope*), with its chestnut-coloured head, visits us in vast numbers in October, frequenting the coast and salt marshes or inland lakes and swamps until the following March, when it takes its departure north, leaving only a few birds to nest in the north of Scotland. The Wigeon is taken in great numbers, for, unlike many waterfowl, it feeds boldly by day, and is not afraid of approaching man and his habitations. Much of the bird's food consists of grass and other vegetable substances, insects, etc. The nest is made of decayed rushes and reeds ; from eight to fourteen creamy-white eggs are laid.

The Pochard (*Fuligula ferina*), though it has a bright chestnut head, is chiefly dusky in tint elsewhere. It is commonly known as the Red-headed Poker or Dun-bird. It differs from the foregoing birds in being a skilful diver. It is mainly a winter visitor, but comes in such numbers that it falls to the seaside fowler probably more abundantly than any other species. Birds that feed on inland waters are much better eating than those whose diet is principally marine molluscs, etc. The seven to ten eggs are coloured greenish drab.

The Eider Duck (*Somateria mollissima*) has a black crown ; neck and back, white ; underparts, black. It averages about five pounds in weight, whereas a sheld-duck rarely exceeds four pounds, and a mallard much less. Though on our southern and western coasts it is only known as a winter migrant, the bird breeds in the Shetland, Hebrides, and Orkney Islands, and at other points along the coast, as far south as the Farne Islands, off Northumberland, but not in sufficient numbers to make it of any great importance. The Eider Duck is a diver, feeding largely on shell-fish, which are often swallowed entire. Immense numbers of Eider Ducks visit Iceland, Farøe Islands, rocky coasts of Norway and similar regions, in May and June, for breeding purposes. The female covers her eggs with down, which she plucks off her breast. The collection of the down forms an important occupation for considerable numbers of northern people, and even when the commodity is unbleached it realises twelve shillings or more per pound. So exquisitely soft is eider-down that the collectors pack it into 3 lb. balls, about the size of a man's hand ; but when opened out and expanded by heat there is sufficient material to make coverlets for a couple of single beds. Very often a pair of birds will suffer their nest to be robbed of eggs and down twice ; for a third clutch of eggs the drake supplies the down, and if that be taken by a collector the nest will be deserted.

The Black, or Common, Scoter (*Edemia nigra*) frequents our seas in winter, and at some points of the coast the water is literally

covered with them. It is the only black Duck that visits us, so that there is no difficulty in recognising it. In spring the majority of the birds return to the north of Europe, but a few may remain in Scotland. The nesting habits are similar to those of the eider duck ; the eggs are yellowish white.

The Goosander (*Mergus merganser*) is another winter visitant, and far commoner in Scotland than in either England or Ireland. It resorts to bays and estuaries, and when it ascends rivers, or transfers itself to lakes, it works great havoc among trout and other fish. The bird is greenish black on the head and back, and chiefly buff elsewhere.

The Red-breasted Merganser (*M. serrator*) is not only brilliantly plumaged, but has a very distinctive crest at the back of the greenish-black head. 'Merganser' means 'diving-goose,' indicating its size and habit of diving for fish in freshwater lakes and rivers. Its bill is notched very much like a saw, by means of which the bird can retain even a wriggling eel. Only a few birds nest on our Scottish and Irish lakes ; the eggs are whitish ash.

Closely allied to the Ducks are the South American Screamers, which form but one family and an order (Palamedeæ) in themselves. The Derbian Screamer (*Chauna chavaria*) is one of the best-known species. It has a fowl-like bill, and its long toes are only partially webbed. It wades, swims, and also soars to a great height. When tamed, one of these birds, as big and strong as a swan, will offer fight to any bird of prey that attempts to carry off poultry.

ORDER : COLUMBÆ

THE PIGEONS

The Pigeon tribe contains many interesting and beautiful birds spread through every part of the globe. Their wings are pointed, and with few exceptions their powers of flight are of the highest. Many of them are migratory. They pair together with the greatest constancy, usually for life, as do many other birds, the goose, swan, etc., sharing between them their common nest and the care of the young ; the male sits alternately with his mate, covering the eggs while she is absent in search of food. When the young are hatched, they are unfledged and blind, and are at first fed with a milky fluid disgorged by the parents from peculiar glands in the crop ; at a later stage the food consists of grain softened in the crop.

Our domestic Pigeons include many breeds and varieties, differing so much in size, plumage, and even shape, as to cause doubts whether they can belong to the same family. In colour most of the Pigeons are soft and pleasing, but noted for neither depth nor brilliancy, although the neck often glows with a changeful beauty ;

and some of the tropical birds assume very elegant forms clothed with magnificent feathers.

The family Treronidæ includes the Painted Pigeons, brilliantly coloured birds, ranging from the Malay Peninsula to Australia, and the Fruit Pigeons, rather large birds, that live chiefly on wild



BLUE-TAILED FRUIT PIGEONS

fruits. The Nicobar Nutmeg Pigeon (*Carpophaga insularis*) eats the wild nutmeg whole, but it only digests the mace, the remainder being ejected. The Blue-tailed Fruit Pigeon (*C. concinna*) is a native of New Guinea and various East Indian islands.

The family Columbidae contains the majority of our familiar birds. The most conspicuous domesticated varieties are the Carrier, or Homing Pigeon, often employed in carrying messages, sometimes at the rate of 60 miles an hour ; the Fantail, with more feathers in its tail than any of the others ; the Pouter, which can inflate its crop with air until the head is almost hidden behind it ; and the Tumbler, which has a singular habit of falling backwards when on the wing. But all our domestic breeds are descended from the Blue Rock Dove (*Columba livia*), common over most parts of Europe, Northern Africa, and in the East extending to India. It is a bluish-grey bird ; neck and upper breast, green and purple ; wings and tail, barred with black. It frequents rocks rather than trees, and domestic Pigeons that revert to a wild life seek rocks or buildings, even though trees be at hand.

The Stock Dove (*C. ænas*) takes its name from its habit of nesting in the stocks or stumps of trees ; but it also often selects the ledges of steep cliffs. It is commonest in the southern and eastern counties.

The Wood Pigeon, or Ring Dove (*C. palumbus*), is distinguished by a white patch on each side of the neck, and the white edges of the wing. It is one of our commonest British birds. Its food consists of seeds and grain ; in spring it does no little damage to the young corn ; and in autumn it feeds upon the ripened grain. The nest, generally placed high up in a tree, is often so loosely put together that the two pure white eggs are visible through the interstices of the structure. The Wood Pigeon is a timid and wary bird in the country, but when it finds its way into a town, it speedily gains confidence ; for example, a nest was built only a few feet above the pavement on the Thames Embankment, where the sitting bird appeared to be quite oblivious of the noises of the electric trams, the toots of motor-horns, and other distractions of that busy thoroughfare.

The Passenger Pigeon (*Eclopistes migratorius*) is a native of America, and before the development of the United States existed in countless myriads. Its power of wing is almost incredible, and birds have been shot in New York with Carolina rice in their crops, showing that the birds' feeding ground was quite four hundred miles away, entailing a daily journey of eight hundred miles, accomplished at the rate of about a mile a minute. During the breeding season, formerly, immense numbers of Pigeons would settle in one spot, and Wilson mentions a tract in Kentucky, forty miles long and several in breadth, where every tree was loaded with nests ; the wings of the fluttering multitudes roared like thunder ; hawks, buzzards, and eagles seized old and young at their pleasure, and below, wild hogs fattened upon the young birds that fell from the nests.

The members of the family Peristeridæ frequent the ground much more than the foregoing birds. Of many species the Turtle



YOUNG TURTLE DOWES

Dove (*Turtur communis*) and its mate have been celebrated in all ages for their constancy and affection, although as a matter of fact they are no more praiseworthy than many other birds, such as the raven, etc. The Dove is frequently mentioned in the Scriptures for its swiftness, beauty of plumage, its mournful, plaintive cry, etc. It was sent as a messenger out of the ark ; it was ordained as a sacrifice by the Israelites ; in Babylonia it was the bird of Astarte, the goddess of Nature ; and among the Greeks was one of the birds of Venus. Its range is wide, including all southern Europe, Palestine, and many other parts of Asia. It is only a spring visitor to the British Isles, and may be known readily by the four rows of black feathers tipped with white, which are found on the sides of its neck. The Collared Turtle Dove (*Columba risoria*), which is often kept in cages, is quite a different species ; its distinguishing feature is the black crescent forming nearly a complete ring round the neck.

ORDER : GALLINÆ

GAME-BIRDS AND FOWLS

This order is of prime importance, because it contains most of the species that are known as " Game"-Birds (grouse, pheasant, partridge, etc.), and the Domestic Fowls, with their almost innumerable varieties. Most of the Gallinæ, whatever their size, are of robust build ; their legs and toes are strong for running and walking, and the stout, curved claws are specially adapted for scratching up soil in search of food. The bill is fairly long, the arched upper mandible overhanging the lower one ; the wings are close-fitting ; the tail is sometimes enormously lengthened ; and the flight is extremely rapid for short distances. The food consists principally of grain, seeds, roots and buds, but in many species the young at least are fed largely on insects. The digestive organs of the gallinaceous birds consist of a spacious crop in which the grain is first macerated, and passing thence to the gizzard to be reduced to a pulp. The grinding action of the gizzard is assisted by small stones, pebbles and sand, which are swallowed for the purpose. The methods of nesting, among species and varieties whose name is legion, naturally vary considerably, but the majority build on the ground, some in trees, and a very few propagate their species in quite reptilian fashion. With few exceptions the young ones are clothed with beautiful down at birth, and they are able to run within a few hours after emerging from the egg.

FAMILY : TETRAONIDÆ

THE GROUSE AND PTARMIGAN

The Capercaillie (*Tetrao urogallus*) is the finest species of the family group of grouse and ptarmigan. It is chiefly chestnut-brown in colour, marked with blackish lines on the upper parts ; the black

tail is spotted with white ; the head and neck are dusky ; the breast is lustrous green, and the feathers of the throat are long and black. The skin over the eye is bare and red, and there is a white spot below. The bird is three feet in length, and weighs from eight to twelve pounds, or about the size of a turkey. Known also as the Wood-Grouse and Cock of the Woods, the Capercaillie is common in Northern Europe, and various Alpine regions ; it became extinct in the British Isles about the middle of the eighteenth century, but was reintroduced in 1837, and is again common in the fir and larch forests of Central Scotland. It is a remarkably shy bird, but possesses one weakness that often proves its undoing. When serenading the females, the male bird protrudes its neck, ruffles the feathers of its head, and throws itself into various strange attitudes, while it utters a cry something like the sound of the whetting of a scythe, winding up with a gulp, during which it partially closes its eyes. The bird is often too absorbed to notice the approach of the sportsman, who is guided to the spot by the bird's noise. The nest is made on the ground, simply heather and bracken in a hollow ; the eggs are yellowish white, spotted with orange-brown. The flesh of the Capercaillie is delicious eating, especially when it has been feeding on the cranberry, whortleberry, and bay leaf.

The Black Grouse (*T. tetrix*) is a duskier bird, with a very distinctive, much-forked tail, the outer feathers curving outwards ; the skin of the eyebrows is the deepest scarlet. Its nest and eggs are very similar to the last-named. A native of the northern countries of Europe and Asia, this species was formerly common throughout Great Britain, but with the exception of the south-west counties, is now largely restricted to Scotland. The male bird is

called a Black Cock and the female a Grey Hen. Sportsmen generally only shoot the former, leaving the hens for breeding.

The Willow Grouse (*Lagopus albus*), a northern and slightly bigger bird, is chiefly noticeable for its seasonal changes of plumage ; in summer and autumn it much resembles the red grouse, but its winter dress is white. The bird is extremely hardy, passing the night in holes in the snow ; and when pursued it will dive precipitately into loose snow, and work its way beneath the surface, just as the other species do among the heather.



WILLOW GROUSE

The Red Grouse (*L. scoticus*) is a native of the British Isles, and favours no other country with its presence. Its plumage is

a rich chestnut-brown, diversified with zigzag bars and dots of black; its feet and toes are covered thickly with grey hair-like feathers. It is abundant in all our high moorland districts, and especially in Scotland. The nest of heather and grass is often placed in a tuft of bilberry or other moorland plant; the eggs, eight to twelve in number, are reddish ash, blotched and spotted with reddish brown. The young birds are adepts at concealing themselves, for the hooded crow and other predaceous birds are always on the look-out for them. When disturbed, both old and young seek cover rather than take to the wing, and when pressed to fly they rise singly, and not in a party like a covey of partridges.

The Ptarmigan (*L. mutus*) is a native of the northern parts of Europe, and many of the higher mountain ranges; and in Scotland it chiefly frequents the more desolate mountain tops. In autumn both sexes change their summer garb of black and white for grey, and in winter they become white, except for the outer black tail feathers. From the north of Europe we import vast numbers for food, and one vessel from Norway will sometimes carry twelve thousand brace for our poulterers' shops.

FAMILY: PHASIANIDÆ

THE COMMON PARTRIDGE (*Perdix cinerea*)

The Common Partridge has its home in Europe and Western and Central Asia; it is abundant in Great Britain, especially the south-eastern counties. Its garb is several shades of brown mixed with grey on the upper parts; on the lower breast is a horse-shoe patch of chestnut; and the sides and flanks are barred with the same colour. The bird delights in cultivated land, feeding on green leaves and insects in the spring, and grain and seeds in the autumn. The nest is only a bundle of dry grasses in a hollow in the ground; the clutch of eggs may number twenty. When the young are hatched they are strong on the legs at once, and capable of leaving the nest on the first day; ant-hills are often resorted to by the mother bird and her brood. The family, called a 'covey,' keeps strictly together, and will frequent the same field with great pertinacity. At the least alarm the birds go off with a whirring flight, uttering metallic, far-



PARTRIDGE

reaching cries, just topping a hedge and settling on the other side until disturbed again. The Partridge is very solicitous in rearing its young, and adopts all kinds of ruses to draw intruders from the vicinity of the brood. Ground birds are subject to a host of enemies, both furred and feathered; but a couple of Partridges have been seen to drive off a carrion crow.

The Red-legged Partridge (*Caccabis ruja*) is a native of Southwest Europe, particularly France. It is a stronger and more brilliantly coloured bird, which has been introduced into England with considerable success. Its flight is heavy but rapid, and it prefers to frequent uncultivated tracts. Unlike the Grey Partridge, this bird often runs before the sportsmen, only rising when out of shot. There are many other species of Partridge in different parts of the world, but too similar in habits to call for extended notice.

THE PHEASANT (*Phasianus colchicus*)

Though the Pheasant is a common bird of our countryside, its native home is Asia Minor, from whence it was introduced into many European countries on account of its beauty of form and



COMMON PHEASANT

the delicacy of its flesh. Although it has become thoroughly naturalised, it is severely tried in hard winters, and would die unless food were provided for it in the game preserves; it is, in fact, a semi-domesticated bird; in many cases the eggs are hatched under hens, and only innate timidity prevents the little Pheasants from becoming as tame as our farmyard chicks. The plumage of



PLATE XVIII

Capercaillie
Woodcock

Snipe
Amherst's Pheasant

the Pheasant is principally a mixture of brown, yellow, orange-red, purple, green, and black; the head and neck are glossy green, blue, and purple, and the tail is very long, especially the middle feathers, in marked contrast to the partridge. The bird runs along with its head thrown forward and lowered to a level with the body; it is a ground lover, and when chased will always attempt to use its legs instead of its wings. It is crafty, too, and when alarmed will skulk behind bushes or through hedges, and then run for fresh cover with great rapidity.

The Pheasant is under the strict protection of the Game Laws, but its habit of roosting on the low branches of trees is a sore temptation to the poacher, and gamekeepers have to evince the greatest watchfulness over the preserves. Though a great deal of its food consists of insect pests, the Pheasant lives largely on grain, beans, peas, etc., and in that respect is not a friend of the farmer. The nest is a mere hole with a bed of grass and leaves, in which are laid from a dozen to a score of pale olive-brown eggs, similar to those of the partridge.

Although the British Pheasant is a really handsome bird, its plumage cannot compare with some of its Eastern cousins. The Silver Pheasant (*Gennæus nycthemerus*) of Southern China wears a black crest; its upper parts and long tail are pure white, diversified with fine black lines pencilled with great regularity across the feathers. The Golden Pheasant (*Chrysolophus pictus*) has a fine amber-yellow crest, the back is rich yellow, and the similarly coloured upper-tail coverts have a crimson border; and other colours disposed about the body are chestnut, black, blue, and green. As with other species, the female is very soberly clothed in rusty brown, with darker marks and spots; and her tail is not nearly so long as her mate's.

Among the most gorgeous birds of the family is Lady Amherst's Pheasant (*C. amherstiae*). The top of the head and chest are bronze-green; the crest is blood red, the cape, pure white, but barred with steel-blue black; the middle of the back is a splendid mixture of black, orange-red, and buff; and the long tail feathers are light olive-green, the middle pair showing bars of black. This verbal description is only fragmentary, and does not do even mild justice to the bird's brilliant yet beautifully soft colouring.

The Argus Pheasant (*Argusianus giganteus*), though scarcely larger than a common fowl, has its feathers so greatly developed that it is quite five feet in length. The most noticeable features of the plumage are the yellow and black spots on the breast of warm chestnut-brown, and the black rings, each containing a white spot, on the chestnut tail. It is from these eyes that the bird takes its name in reference to Argus of mythology, whose hundred eyes could only be charmed to sleep by Mercury's magic lyre.

THE QUAIL (*Coturnix communis*)

The Common Quail, typical of many species, is a small partridge-like bird, only seven and a half inches in length, short-legged, round-bodied, and pleasantly clothed in a mixture of brown, yellow, and white. It is spread over nearly all Europe, and parts of Africa and Asia. It is a most productive little bird, or its continual persecution by human beings and birds of prey must of necessity have exterminated it. It visits England in the summer, but not in large numbers. In the Scriptures it is recorded how the Israelites were miraculously provided with food, when "at even the Quails came up and covered the camp." This is in strict accordance with the migratory instincts of the bird; and in some of the Mediterranean islands in particular, it is shot, netted, and snared in thousands, for, when fat, the flesh, roasted or cooked in a pie, is delicious, and is in great demand. In some regions Quails are preserved in jars and casks with layers of salt. Live birds are imported into our country, often fifty thousand at a time. Shipped at Alexandria or Algiers for Marseilles, they are conveyed by rail across France in cages holding a hundred birds each. Attendants feed the captives on the way, and only a very small percentage die during transit, and in this manner 200,000 Quails a month reach Leadenhall Market alone.

THE PEAFAWL (*Pavo cristatus*)

The Peafowl, of which there are two species, is the largest and most magnificently adorned bird of the whole order, taking the highest rank among all birds for splendid plumage and effulgent



PEACOCK

colouring. The ordinary species is a native of India, Assam, and Ceylon, the second is found in the Indo-China countries, Malay Peninsula, and Java. The train of the Peacock in reality consists not of the tail, but the upper-tail coverts, which are enormously developed in length, each feather terminating in rounded, battledore-shaped webs, coloured emerald green, deep violet, greenish bronze, gold and blue, in such a manner as to form a distinct eye. The tail feathers themselves are short and rigid, and serve to keep the train spread, when the bird is walking about in all the majesty of its expanded plumage.

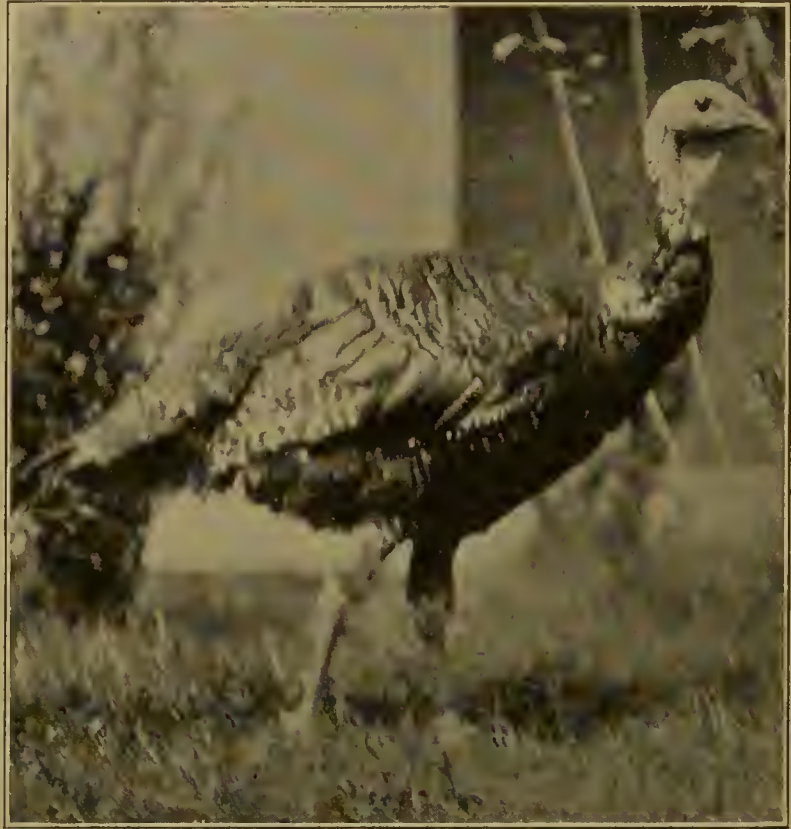
In some parts of India the Hindus view the Peacock with deepest reverence, and object to it being shot, although flocks of thirty and forty do much damage in cultivated districts ; sometimes a thousand or more birds are to be seen together at one time. The male and his harem of four or five roost on the lower branches of high trees at night, but the nest is made on the ground, the pea-hen usually sitting on quite a dozen eggs. It is supposed that Alexander first brought the Peafowl to Europe, and the bird became a famous dish at the costliest regal boards ; in England a Peacock pie with the head and spreading tail protruding from the crust was a Christmas speciality.

THE DOMESTIC FOWLS

The several species of Jungle Fowl are natives of India, the Indo-Malayan countries, and neighbouring islands. The Red Jungle Fowl (*Gallus gallus*) ranges from Cashmere to Assam, and thence to Cochin-China and various East Indian islands. Its eye is flashing ; comb and double wattles of brightest scarlet ; hackles of the neck and lower part of the back, orange-red ; upper back, deep blue-black ; shoulders, ruddy scarlet. The long, drooping tail is blue-black glossed with green. It is from this bird that are descended all our numerous breeds of poultry, which are too well known to require much description.

The Game Fowls were formerly trained for combat, and cock-fights were a popular amusement throughout the country until the savage sport was prohibited by law. The Cochin-China is a large breed ; the Black Spanish is noted for the quality of its flesh and its regularity in laying ; the Dorking is short-legged, plump-fleshed, attaining a weight of from ten to twelve pounds, and is a prolific layer. It is remarkable for having a double hind toe. The Bantam is the smallest breed, but is of exceedingly fearless carriage, and quite capable, by sheer doggedness, of overcoming a big Cochin-China or Spanish cock. The Common Barn-door Fowl is of no particular breed, a mixture of many varieties. Of all the birds over which man has made conquest, the most useful has been the cock and hen, the whole world being able to testify to the utility and excellence of the flesh and eggs of the domestic poultry.

The Turkey is another capital example of the success with which some birds can be acclimatised in countries far from their native home. Its habits in a state of domestication are practically the same as those of the common fowl, but the habits of any of the wild species of Central and South America are well worth notice. The Common Turkey (*Meleagris gallopavo*) is an inhabitant of Northern Mexico. The female makes her nest in a secluded spot, and to reach it seldom employs the same path twice in succession. When the young are about a fortnight old they are able to roost in



AMERICAN WILD TURKEY

trees, safe from many enemies that are to be encountered on the ground. The great horned owl, however, is always on the alert to snatch a young bird from the branches. The slight rustling of the owl's wings often gives the watchful Turkeys notice of its coming; and when the swoop is made, the intended victim ducks down its head, and flattens its tail over its back, and the bird of prey finds no hold for its talons. Before it can renew the attack, the whole flock drops from the boughs and hides in the thick under-wood.

The Guinea Fowl (*Numida meleagris*) is an African pheasant, and the ancestor of our prettily spotted domestic breed, which has much the habits and propensities of the turkey. Its naked head

is surmounted with a horny casque, and the bare skin round the eyes falls in wattles below the throat. The body is heavy in proportion to its wing powers, and the flight is hasty, with much flapping of the wings; but the Guinea Fowl trusts largely to its legs for locomotion, and those who endeavour to catch it will be impressed with its celerity. In the poultry-yard it is not a great favourite, for it not only quarrels with the common fowls, and injures them with its sharp beak, but it often wanders a mile or two from home. It is, however, a profitable bird if well watched, for the cost of its keep is very trifling, and the flesh of the young birds is particularly good. Both in the wild and captive state the Guinea Fowl is wary and suspicious, and particularly careful not to betray the position of its nest, thus often giving great trouble to the farmer. The number of eggs is rather large, being seldom below ten and often double that number. Their colour is yellowish red, covered with very little dark spots, and their size is less than that of the common fowl; their shells are extremely hard and thick. This bird has been acclimatized in the New World, where it is reckoned among the game-birds, and shot accordingly.

MISCELLANEOUS GALLINACEOUS BIRDS

In the family Megapodiidæ are the Megapodes, or Mound-builders, and the Brush-Turkeys; the former are natives of Celebes, the Moluccas and adjacent islands, and the latter belong to New Guinea and Australia. The Nicobar Mound-Builder (*Megapodius nicobariensis*) is a brown and grey bird that frequents dense thickets near the coast; the Australian Brush-Turkey (*Catheturus lathamii*) is generally dusky with a pinky red naked head, and a bright yellow wattle; and these two birds will serve as examples for the more or less very similar species.

The incubating methods of the Megapodes are quite unlike those of any birds yet mentioned. The nesting mound consists of soil and decaying vegetable matter, which a pair of birds scrape together with their feet. After a time fermentation engenders heat, and the eggs are laid and buried, nine or twelve inches apart, at nearly an arm's depth. The bird takes no further notice of the eggs, which in due course are hatched by the heat of the mound of decomposing matter, which, not uncommonly, is fifteen feet high and sixty feet in circumference at the base. The young birds are not only well feathered when they break out of the egg, but they are able to fly.

The Crested Curassow (*Crax alector*) is one of the various splendid birds in the family Cracidæ, which range the forests of tropical America. It is nearly as large as a turkey, but more imposing in form and colour. The breast and abdomen are of purest white, contrasting beautifully with the dark violet and purplish green

of the upper parts, the golden yellow crest adding a final touch of beauty. The bird is quite commonly domesticated in native



CRESTED CURASSOW

and European settlements, for it breeds freely, requires little or no care, and its flesh affords excellent food.

The Guans of the Central and South American forests are about the size of the common fowl, breeding in single pairs, but in other parts of the year flocking together in immense numbers.

Of all the forms in the whole class Aves none is more remarkable than the Hoatzin (*Opisthocomus hoatzin*) of South America, which many naturalists refer to a distinct order of its own. Externally, it somewhat resembles the guans, but it possesses some features that appear to connect it with the rails and cuckoos. The chief interest centres in the young bird, which is born with four complete legs, the wings terminating in toes furnished with claws. For a short period the newly hatched Hoatzin is actually an arboreal feathered quadruped, using its legs and wings for climbing about the branches. In a short time the claws are shed, the toes flatten and fuse together, feathers make their appearance, and the wing assumes the form common to all birds.

ORDER: FULICARIÆ

THE RAIL-LIKE BIRDS

The members of the order Fulicariæ are close-winged birds, whose bodies are particularly compressed laterally, so that they can glide through a thick growth of reeds or tangled grasses with remarkable ease and quickness. The wings are comparatively feeble, and the mode of flight rather constrained; but, nevertheless, migrants contrive to effect some fairly protracted journeys. Most of the Rail-like birds are good swimmers, although the toes are long and widespread; but in at least one genus the toes are bordered by a narrow membrane, and in another they are quite lobate, as shown in the photograph of the coot.

The Common Water-Rail (*Rallus aquaticus*) of Europe in form and habit much resembles other species found in different parts of the world. It haunts marshes, pools, and watercourses, and lives on worms, molluscs, and aquatic plants. Many of our native birds move southwards in autumn, but their places are taken by others from the Continent. Though rather common in England, its recluse habits prevent it from being seen readily, and it eludes even a dog as it winds in and out of close reed covers. The Water-Rail does not take readily to the wing, but will run over the weedy surface of the water, its widespread feet finding support on the floating leaves. If hard pressed when it is swimming, it will dive and rise at a distance. In colour the bird is chiefly reddish brown marked with black, the front under-plumage being lead-colour. The nest of coarse grasses, reeds, and sedge leaves is generally placed in a least accessible part of a reed or osier bed; the yellowish eggs are spotted with reddish brown and ashy grey. The young are odd little creatures—round, and covered with soft thick down. Almost immediately after emancipation from the egg-shell, these little puffy balls of down tumble into the water, and swim about as merrily as if they had been accustomed to the exercise for years.

The Land-Rail, or Corncrake (*Crex crex*), is one of our summer visitors from South Africa. It is ten inches long, and almost as large as a partridge; it is chiefly brown, chestnut, and rusty red above, lighter beneath, and the flanks are barred with white. It is to be found in most parts of the British Isles, frequenting long grass and cultivated land. Though it is seldom seen, it announces its presence in the evenings by a rough, grating call that is kept up with monotonous persistency. The continuous *crek-crek* can be heard distinctly for a distance of half a mile. The sound may be imitated almost exactly by drawing a stick smartly over the large teeth of a comb; and often by that means the bird may be decoyed into sight. When captured, the Corncrake simulates death, and often contrives to escape if the eye of its captor is otherwise



AUSTRALIAN RAIL

engaged. One bird allowed itself to be placed in the game-bag, carried home, and laid on the table, without exhibiting signs of life, until an open window offered a chance of freedom. The nest is a slight collection of straws placed in a hollow in the ground; the rather large eggs are buffy white, spotted with rusty brown.

The Moorhen, or Waterhen (*Gallinula chloropus*), is a common British bird wherever reedy or rushy waterbanks offer it a refuge. Its plumage is deep olive-brown above, the underparts being slate colour with white on the flanks. When startled, the Moorhen dives instantly, taking refuge under floating weeds, only leaving its nostrils uncovered by water. The nest is a rather large collection of sticks, dry rushes, and reeds, lined with leaves and grasses; the eggs, often ten or more, are buff, blotched or spotted with orange-brown. When the bird leaves her nest, she usually scrapes leaves and rushes over the eggs, not to keep them warm, but to hide them from prying crows and magpies. The young birds can swim almost as soon as hatched, and not a few fall victims to the greedy pike, which pulls them down before they know there is a foe beneath them.

The Common Coot, or Bald Coot (*Fulica atra*), is one of our familiar water-birds; it is greyish black above and bluish grey beneath. Its most noticeable feature is its short legs, with long, thick, and lobed toes. In general habits it resembles the moorhen. The nest consists of the usual dried reeds and water herbage, and is often placed upon the top of a little hillock almost covered with water. Even if a flood come the Coot troubles but little; she sits quietly on her eggs until the nest floats and is stranded on

a muddy margin. The eggs are stone colour, with dark brown speckles and spots.



COOT

ORDER : ALECTORIDES

THE BUSTARDS AND CRANES

Ornithologists are by no means in agreement concerning the classification of the Bustards, Cranes, and various other birds closely related to them. In some schemes, for example, the Bustard is grouped with the rails, while in others the rails are members of the Alectorides, the reasons in each case depending upon very technical details.

FAMILY : OTIDIDÆ

THE GREAT BUSTARD (*Otis tarda*)

Although formerly it was tolerably common on the plains and waste lands of this country, the Great Bustard is now only one of our very rare visitors. It is found sparingly in Western Europe, but in the South-east and Southern Siberia it gathers in considerable flocks. The male attains a height of nearly four feet, and may weigh as much as 30 lbs. It is greyish white on the head ; upper plumage pale chestnut barred with black ; the tail, similarly coloured, but with a white tip ; lower parts, whitish ; and tufts of white hairs hang from each side of the chin. Though it is powerful and even rapid in flight, the Great Bustard relies much upon its stout legs when it is chased, and has been captured by greyhounds. A most curious feature of the male is its manner of seeking to impress its prospective mate. In its courting display it turns up its tail, which it lays flat on its back and keeps in position by crossing its wings above it. The head is laid back between the shoulders, while a membranous pouch on the forepart of the neck is inflated until only the crown of the head and the whiskers are visible.

The food of the Great Bustard consists of grain, seeds, insects, small reptiles, etc. Its nest is only a hole in the ground ; the two or three eggs, which are larger than those of the turkey, are



GREAT BUSTARD

pale brown spotted with dull red. It is asserted frequently that the bird pays its rare visits only to our southern counties, which scarcely coincides with an incident that occurred in June, 1910. A clergyman was climbing the mountains that flank the Troutbeck Valley, in the Lake District, and was nearing the summit of Ill Bell (2746 feet), when he was startled by a huge bird hovering about him in a threatening manner. Presently it became aggressive, and, being

joined by its mate, the situation grew rather alarming. Though the clergyman fought the birds with his stick, he was at length forced to retreat. His assailants proved to be a couple of Great Bustards that in all probability were nesting in the neighbourhood.

There are other species of Bustard in different parts of Africa, from the north almost to the Cape, and in India, China, and Australia ; but they present no great differences in their habits. The Cariama (*Cariama cristata*) of South America much resembles the secretary-bird in form, and in its liking for snakes and lizards ; and the Trumpeter (*Psophia occipitans*) is often trained by the Brazilian to guard ordinary poultry from birds of prey. These birds belong to entirely different families, and may be considered as connecting the Bustards with the Cranes.

FAMILY : GRUIDÆ

THE COMMON CRANE (*Grus cinerea*)

At one time the Crane was classed with the herons and storks, with which it has little in common except in external appearance.

The Common Crane exhibits the characteristic features of nearly a score of species found in many parts of the Old World and North America; the European birds winter in North Africa, and the Asiatic members chiefly in India. It is a long-necked, long-legged bird, from four to five feet in length.

In colour it is mostly soft ashen grey, and the primaries are black. The well-known plumes are the elongated tertials, with their long, drooping, loose webs, which reach beyond the primaries. A couple of centuries ago large flocks of Cranes visited the Fens in summer, and the bird often figured as a special dish at notable feasts. It is now only seen at very long intervals; and when its presence is re-



COMMON CRANE

ported, inquiry often proves that a heron has been mistaken for it. The Crane is a gregarious bird, flying in V-shaped flocks like the geese, but at so great a height that, although its hoarse cry is audible, the bird itself is out of sight. It generally feeds on snails, frogs, and worms, but it is not at all averse to newly sown grain. It is a very suspicious bird, usually alighting only where it can obtain an uninterrupted view. The nest of reeds and rushes is generally in the midst of a bog; the two greenish-ash eggs are blotched and spotted with brown and dark green.

The Demoiselle Crane (*G. virgo*) is an exceedingly pretty bird that breeds in the south of Europe, Northern Africa, and various regions in Eastern and Central Asia, wintering chiefly in Central Africa and India. It is only about thirty inches in length, and is marked for the soft texture of its flowing plumage, and the delicate greys of its feathers.

ORDER : LIMICOLÆ
THE PLOVER TRIBE

This order consists of numerous species of birds, varying in size, shape, and coloration, which give rise to considerable diversity of classification. Sometimes they are considered as forming but a single family, but more often three families are accounted the better plan ; but as to further separation into sub-families and genera, naturalists appear to be almost hopelessly at variance. Briefly, the members of the order are adapted by structure for feeding on marshes, and muddy and sandy shores ; some have unusually long legs and powerful bills ; others are saved by their long bills alone from soiling their plumage in muddy places ; and yet others have marked aquatic powers and propensities. The number of toes vary, but whether they be three or four, they are more or less connected by a membrane at the base, and in some cases they are lobated. The eggs of most of these birds are richly coloured, and the nest more often than not is only a hollow in the ground. The young are quite active when hatched, and their clothing of down generally largely coincides in colour with their surroundings. The flesh of most of the following birds is greatly esteemed, and the sportsman's bag is not accounted complete without them.

FAMILY : CHARADRIIDÆ
THE PLOVERS

There are many different species of Plovers, but those that breed in the British Isles will serve our present purpose. Some are inhabitants of open districts and wide wastes ; others prefer sand-banks or beds of shingle on the coast, or in river estuaries. Except during the breeding season they flock together in large numbers, and all of them are of migratory habits.

The Golden Plover (*Charadrius pluvialis*) is a British resident throughout the year, but in winter its numbers are augmented by large flocks from the Continent, frequenting both pastures and coasts for worms, insects, molluscs, etc. The bird is nine inches in length. The upper parts of the body are dark brown, beautifully spangled with golden yellow ; the under parts are dusky white, with darker marks on the chest. In March the winter dress undergoes a change ; a few black feathers appear on the breast, until by May a broad expanse of jet-black covers the front of the neck, the chest, and under parts. This black is margined by a line of white, blending into the rest of the plumage. Towards the end of August the Golden Plovers congregate in immense flocks, ranging the fallows and newly sown wheat fields ; where they remain until severe weather drives them to the coast.

The Ringed Plover (*Ægialitis hiaticola*), often called the Ringed Dotterel, is chiefly a study in black and white, in which the white collar and the black gorget are noticeable features. It is only seven and a half inches in length. It frequents most parts of our coasts, where low water exposes wide expanses of sand; it runs rapidly, and among shells and shingle it is practically invisible. The eggs are large and pointed, olive-yellow in colour spotted with black and grey; they are placed in a hollow in the sand or shingle. The young birds can run as soon as they break out of the shell; and when danger threatens they scatter and hide with wonderful address. The Kentish Plover (*Æ.*



RINGED PLOVER

cantiana) is an inch shorter than the last-named, but the Grey Plover (*Squatarola helvetica*) is nearly a foot in length; and both birds have all the common characteristics of the tribe.

The Lapwing, Peewit, or Green Plover (*Vanellus vanellus*) is probably better known than the preceding species, if only because its eggs are a noted table delicacy. It is rather a handsome bird in its summer dress. The top of the head is black, as is the crest, which can be raised or depressed at will; the sides of the face and neck are white, speckled with black; the upper parts are shining coppery green, glazed with purple; the wing is mainly black with white at its tips; the upper tail coverts are chestnut; the tail is half white, half black; and the under parts are white. In winter there is a marked change, the black of the chin and throat, for example, changing to white. This bird has a wide geographical range, and is common in many regions between the British Isles and Japan. Its flapping, wheeling flight is very distinctive, as is its almost inarticulate, mournful cry of "Wee-whit! wee-e whit!" Green Plover eggs are olive-coloured, blotched and spotted irregularly with blackish brown, and they harmonise so well with the ground on which they are laid that it is difficult to discern them at a few yards' distance. If the female, sitting on her eggs, is disturbed, she runs away, tumbling and flapping about as if she had broken her wing, in the hope that the intruder will give chase

and so miss her eggs. These manœuvres are common to all the Plover tribe.

The Thick-knee (*Edicnemus scolopax*) is sometimes classed with the bustards, with which it is said to associate in Northern Africa. It is not an uncommon visitor to our country, arriving in April and staying until October. As it comes from the south it is of more frequent occurrence in the southern than in the northern counties, but it is more abundant in Norfolk than elsewhere, for which reason it is often called the Norfolk Plover. Its ordinary title refers to the strong formation of the knee joint. The general colour of the bird is mottled brown and black. Its eggs, two in number, are light dingy brown, covered with splashes and streaks of slaty blue and dark brown. When hatched, the young birds are covered with soft, spotty down, so like the stones and soil on which they repose that they easily escape the notice of any but a practised eye.

The Common Oyster-Catcher (*Hæmatopus ostralegus*) is another of our well-known coast-birds ; from the black and white hues of its



BLACK OYSTER-CATCHER

plumage it is often called the 'Sea-Pie.' It haunts sandy bogs and submersed rocks, hunting with great animation for molluscs, mussels, limpets, etc. It is swift of foot, a good swimmer, takes to the water for food, and can dive when alarmed. This bird is black on the head, neck, and terminal half of the tail ; the upper tail coverts are

white ; the legs and toes are pink, and the eyelids crimson. Its range is very wide, including the whole of Europe, a great part of Eastern Asia, and Northern Africa. The nest is usually little better than a simple depression among the shingle above high-water mark ; but on rocky shores a few blades of grass or bits of seaweed may be used. In America and Australia are species that are quite black ; the photograph shows the American Black Oyster-Catcher (*H. niger*).

FAMILY : SCOLOPACIDÆ

THE WOODCOCK (*Scolopax rusticola*)

The Woodcock is chiefly a winter visitor to the British Isles, arriving from the south about October and leaving in March and April. A considerable number of birds, however, stay throughout the summer, and there are few counties in England where its nest has not been found. The Woodcock is eleven inches in length ; its average weight is twelve ounces. The general colour of the bird is a very pleasing mixture, light and dusky browns, yellow and black. It prefers the earliest dawn and the hours of dusk for feeding and going abroad. It seeks its food in wet and marshy ground, thrusting its long beak as far as the nostrils into the soft, moist earth, and discovering worms with unerring skill. After satisfying its hunger, it returns to its hiding-place among thorns and briers, where it is scarcely distinguishable from the dead leaves around it. It is a very silent bird, hardly ever crying when flushed. Its flight is wonderfully swift, and it jerks and dodges so quickly, when it sees a sportsman, that it often escapes the shot.

The nest of the Woodcock is made of leaves, especially those of the fern. The eggs usually number four, and in colour are buffy white, with blotches of rusty brown. The mother bird has been known to carry away her young when threatened by danger, placing them upon her spread feet, pressing them between the toes and the breast. "Regularly as the evening comes on, many Woodcocks carry their young ones down to the soft feeding-grounds, and bring them back again to the shelter of the woods before daylight."

THE COMMON SNIPE (*Gallinago gallinago*)

The Common Snipe ranges from Ireland to Japan, and from Siberia to the Cape ; and it is to be met with in all damp and swampy places in the British Isles. It is most numerous during the winter months, when immense flights visit us from the Continent. This Snipe is dark brown on the top of its head, with a light streak along the centre ; the cheeks are pale brown, with a dark streak from the bill to the eye. The back is beautifully mottled with two shades of brown. The wings are black, some of the feathers being tipped with white ; and the breast and abdomen are white and the flanks grey-white with dull black bars. The nest is a simple heap of leaves placed under the shelter of a tuft of furze, heath or grass, and the four eggs are olive-white, spotted and dashed with different shades of brown. When flushed, the bird shoots off in a straight line, and then begins to twist and turn in a strangely zigzag fashion, at last darting away and often escaping before the sportsman has got his aim. The male bird, in addition to its ordinary cry, often makes a very singular sound, something between the bleating of a

goat and the buzzing of a slack harp string. This 'drumming' is produced by the action of the wings, assisted by the tail feathers. Although this Snipe is almost equal in length to the woodcock, it is much less in weight; its flesh is of exquisite flavour, the bird being cooked ungutted.

The Great Snipe (*G. major*) is called the Double Snipe, and the Jack Snipe (*G. gallinula*) is known as the Half Snipe, indicative of their size in comparison with the common species. Both of these birds are chiefly winter visitors, although the Great Snipe has been known to remain in the summer to breed.

THE COMMON CURLEW (*Numenius arquata*)

The Curlew is found chiefly upon the seashore and open moorlands, and partly on account of its wild, shy habits, and partly because its flesh is very delicate and well-flavoured, it is greatly



CURLEW

pursued by sportsmen.

This bird is most annoying to a gunner who does not understand its ways, keeping just out of gun range, rising from the ground with a mournful cry which alarms every other bird within hearing. It flies off to a distance to alight and play the same trick again.

The Curlew varies in length from twenty to nearly thirty inches, including the long, slender, incurved bill. The general colouring is reddish ash, mottled with dusky spots. The

breeding-grounds are inland, the locality varying according to the character of the district, wild heath and high, hilly grounds being chosen in some places, while marshy and boggy soils are favoured in others. The nest is very slight, consisting of a few dry leaves and grasses scraped together under a tuft of heather or a tuft of rank grass. The eggs are brownish green, with splashes of dark brown and darker green.

There still remain numerous birds of varying interest and importance, to which many pages might be devoted profitably instead

of indicating only their outstanding features and habits. The Avocet (*Recurvirostra avocetta*) is garbed chiefly in white except the head, back of the neck, and portions of the wing, which are black. By means of its webbed feet it is prevented from sinking in the softest mud as it ploughs up insects and crustacea with its slender, recurved beak. The bird once bred in England, but is now only seen at very long intervals, and collectors are not sufficiently generous to allow it to nest and rear its young.

The Ruff (*Totanus pugnax*) takes its name from the ornamental plumes which grace the summer livery of the male ; the female is called the Reeve. The ruff or frill consists of elongated feathers, arising from the neck and throat, while two tufts spring from each side of the head, behind the eyes. In colour this adornment is seldom alike in two individuals, nor in the same bird for two successive years. It may be either jet-black, rufous brown, yellow barred with black, white barred with black, or a mixture of white, black, and brown. Formerly the Ruff and Reeve visited the Fen counties in large numbers, but the habit of the males constantly meeting for pitched battles, always afforded fowlers a good opportunity of securing a good bag.

The Redshank (*T. calidris*) is a striking-looking bird, clothed chiefly in plumage of ashy brown, greyish white, and various zigzag bars of black ; its lower mandible, legs, and feet are vermilion-red. It is a common species during the summer months, especially on the coast of Norfolk, where there are muddy marshes. When feeding, it bores its slender bill into the mud, using its whole weight to assist its purpose. Cold weather drives the majority of the birds southwards, but, nevertheless, some remain on our coasts throughout the winter. The Greenshank (*Glottis nebularius*) is a very similar bird, except for the colour of its legs and feet. It is an annual migrant to the British Isles, breeding chiefly on the northern Scottish moors.

FAMILY : CURSORIIDÆ

THE PRATINCOLES AND COURSERS

Many naturalists would refer the former birds to the family Glareolidæ, and the latter to the Charadriidæ ; and even externally there is one great difference, the Pratincoles having four toes and the Coursers only three.

The Pratincole (*Glareola pratincola*) is a small bird, measuring only nine or ten inches in length. Its plumage is a mixture of greyish brown, white, brownish red, and chestnut, out of which boldly stands a narrow black collar, which ascends to the base of the beak. In some of its habits it suggests the plover, but in its flight, and catching insects on the wing, it more resembles the swallow. Its principal habitat is Northern Africa, and the south-

east of Europe, and only rarely does a bird straggle to the British Isles.

Of various species the Cream-coloured Courser (*Cursorius gallicus*) is perhaps the best known. It is a native of Syria, Egypt, and Abyssinia, Arabia, Persia, and India. In winter the bird is supposed to retire largely to the lakes of Central Africa. Only occasionally does the Cream-coloured Courser wander into Europe, and it is many years since one was shot in Scotland.

ORDER: GAVIÆ

THE GULLS, TERNS, AND SKUAS

The order Gaviæ consists of the Gulls, Terns, and Skuas, which some authorities group with the plovers, from which, in any case, they may be recognised by their webbed feet. Though they are indubitably marine birds, some of them wander considerable distances inland, especially in winter.

FAMILY: LARIDÆ

THE GULLS AND TERNS

This family is divided into three sub-families, viz., the Gulls (*Larinæ*), Terns (*Sterninæ*), and Skimmers (*Rhynchopinae*), in all of which the toes are either freely or partially webbed and the claws rather poorly developed.

There are quite fifty species of Gulls, of which the Common Gull (*Larus canus*) is too familiar to require much description. Its head and neck are pure white; the upper surface is grey, variegated with the white edges, and tips of the secondaries and tertiaries; the tail-coverts, tail and whole under surface are pure white; and the legs and feet are ashen grey. An adult male is about eighteen inches in length; the female is rather smaller. The bird's ordinary food consists of refuse animal matter thrown up by the tide, as well as numerous marine creatures, and it will follow a ship for the offal which is thrown overboard. Its vision is remarkably keen in serving its voracious and omnivorous appetite. Any small scrap of food thrown into the foaming wake of a steamship will be despatched instantly, but it is impossible to trick the bird into examination of anything that is uneatable. In winter and spring this Gull will frequent inland cultivated tracts, and will join rooks and jackdaws in following the plough in search of worms, etc. Though it is well distributed along the British coasts during the colder months of the year, it nests only in Scotland and Ireland, building on the shores of bays, lochs, and inland lakes, and only rarely on cliffs. The nest is rather a large structure of seaweed, grass, heather, etc. The eggs, usually three in number, are olive-brown, spotted with darker brown, but there is much variation in colour.

The Great Black-headed Gull (*L. marinus*), the largest of our



PLATE XIX

Common Gull

Redshank

Great Northern Diver

Storm-Petrel

Avocet



resident species, frequents most of our coasts at all seasons. It is twenty-eight inches in length, and its distinguishing feature is shown in its name. It breeds chiefly in Scotland and Ireland, but is fairly common in Wales and on the south-west coasts; on the Kentish shores, particularly at the mouth of the Thames, the bird is known as the 'Cob.' It is more rapacious than the common gull, and will even attack sickly lambs, and prey upon the eggs and young of water-fowl, game-birds, etc. This marine vulture has no hesitation in swooping down upon a duck or pochard which a fowler has shot, and will tear it to pieces before the gunner can secure his prize.



GREATER BLACK-BACKED GULL

Sometimes a Cob is pinioned, and allowed the run of a garden, stables, etc., and snails, slugs, rats, and mice disappear as if by magic. The Black-backed Gull usually rests on isolated rocks, or cliff ledges. The eggs are stone-buff, blotched with dusky brown.

The Herring Gull (*L. argentatus*) is white save for its pearl-grey upper parts and wings, dusky bill, and grey feet. Its range extends from Northern Europe and America in summer to North Africa in winter. It is principally a fish feeder, living on the shoals which it follows; but like others of its tribe it preys upon the eggs and young of various birds. It often nests in company with the two preceding birds.

The Kittiwake (*Rissa tridactyla*) is one of the prettiest gulls; its head and neck are white; the upper parts are silver grey; the wings are diversified with a little black and much white; the under parts are white, the tail being of the same colour. The bird takes its name from its cry, which much resembles 'Kittiwake' pronounced rather slowly. It is chiefly an inhabitant of the Arctic regions during the summer, although its southern limits include the British Isles, where it nests on rugged cliffs and islands. Its food consists largely of fish; but marked birds have been proved to follow vessels from one side of the Atlantic to the other.

Of the second sub-family the Common Tern (*Sterna fluviatilis*) is a typical example. An adult bird in summer plumage is jetty black on the top of the head and the nape of the neck; the upper part

of the body is ashen grey, and the under surface is white. In length it is about fourteen inches, even including the long forked feathers of the tail, from which it gains its common title, the Sea Swallow. It reaches this country about May and remains until September.



COMMON TERN

Flat shores are generally selected for nesting places, which consist of only a depression in sand or shingle, not always containing even a few dry bents. The eggs vary in colour, but are usually olive-brown, with dusky spots and blotches. The voice of the Tern is a powerful scream, and quite sufficient

to lead to its recognition when in company with other sea-birds, even if its more active and lively flight afforded no clue. Its food consists chiefly of small fish, shrimps, etc. It may frequently be seen quartering the sea from fifty to a hundred yards from the shore, plunging perpendicularly into the water with scarcely a splash to seize a fish that has come near the surface.

The Arctic Tern (*S. macrura*) is very common in the Orkneys and Hebrides, and breeds along our northern coasts as far south as the Humber. The Little Tern (*S. minuta*) has a white forehead and black crown; its upper parts are pearl-grey, and the under parts are white. It is the smallest of the Terns, and often nests in a little colony; the eggs are stone-coloured, spotted with brown and grey.

The Scissor-billed Terns, or Skimmers, are the most remarkable birds of the whole family, taking their name from the unique structure of the bill. Both mandibles are long and compressed to knife-like form and thinness, the lower one being considerably the longer. At first glance this peculiar formation appears to possess no advantage, but it enables a bird to snatch up a fish from surface-swimming shoals with the greatest of ease. The lower mandible acts like a plough; very often the bird skims the surface of the water with it completely immersed, and it catches up its prey without any interruption to its flight. There are three species of Scissor-bills in North America, of which the Black Skimmer (*Rhynchops nigra*) is a good example; and of the remaining species one is Asiatic and one African.

FAMILY : STERCORARIIDÆ

THE GREAT SKUA (*Stercorarius catarrhactes*)

The Skuas have a powerful and hooked beak and claws that eminently fit them for predaceous habits. "Their food is fish," says Mr. Yarrell, "but they devour also the smaller water-birds and their eggs, the flesh of whales, as well as other carrion, and are observed to tear their prey in pieces, while holding it under their crooked talons."

The Great Skua, in colour, is a mixture of brown and chestnut on the head and neck ; the back and tail are brown ; and the neck and underparts are olive-brown. It is a fierce and powerful bird, two feet in length, and it tyrannises in a shameful manner over its weaker relations, robbing them without mercy. It prefers to take advantage of the labours of others to working honestly for its own living. As the lesser gulls are busily fishing, the Skua hovers about the spot, and as soon as a poor gull has caught a fish, down comes the bigger bird upon it with threatening beak and rocking wings, and when the victim drops its burden to escape with greater facility, the Skua darts after the falling fish, and snaps it up before it reaches the water.



GREAT SKUA

The Great Skua is a North Atlantic bird, and breeds largely in the Shetland Isles. Richardson's Skua (*S. crepidatus*), only an inch less in length, nests as far south as Sutherland ; but the Long-tailed Skua (*S. parasiticus*) only rarely finds its way to the British Isles.

ORDER : TUBINARES

THE ALBATROSSES AND PETRELS

Outwardly the Albatrosses and Petrels strongly resemble the gulls, but really they have little or nothing in common. Their distinguishing feature consists in the curiously shaped nostrils which, instead of slits, have tubular openings directed forwards upon the

beak. In size the members of the order vary greatly, for while the Albatross has a wider wing-spread than any other living bird, the Storm-Petrel is little larger than a swallow; but all of them, whatever their size, are particularly strong in flight. There are but two families, viz., the Albatrosses (*Diomedæ*) and the Petrels (*Procellariidæ*).

Of the fifteen species in the first-named family, the largest and best known is the Wandering Albatross (*Diomedea exulans*), a bird of only sixteen pounds in weight, yet often possessing a wing-spread of twelve feet. It is a strictly oceanic bird of the southern hemisphere, rarely coming to land except in the breeding season, and then its choice falls upon isolated rocks, or very remote islands, such as Tristan da Cunha; but there are other species that range as far north as the Behring Sea. The bird's plumage is mostly yellowish white, with blackish bars on the greater wing coverts. Its powers of flight are remarkable. "Although during calm or moderate weather it sometimes rests on the surface of the water, it is almost constantly on the wing, and is equally at ease while passing over the glassy surface during the stillest calm, or sweeping with arrow-like swiftness before the most furious gale, and the way in which it just tops the raging billows and sweeps between the gulfy waves calls forth wonder and admiration."

The voracity of the bird is in keeping with its size and strength; with its large, strong, hooked beak, it easily captures fish of considerable size, and it has been seen to gulp down entire a piece of blubber weighing three or four pounds. The Wandering Albatross nests on the ground in large colonies, building a large conical nest of mud and grass in which to lay its single egg, which is about the size of that of a swan. In 1897 a Black-browed Albatross (*D. melanophrys*) was captured in Cambridgeshire; but although it was so far out of its ordinary latitude, such an incident can scarcely be called remarkable, bearing in mind the powerful flight of these restless beaters of the ocean.

The Petrels are too numerous in species for all to be mentioned, and a few must serve for a curious and interesting family. The best-known British example is the Storm-Petrel (*Procellaria pelagica*), which is known to sailors as 'Mother Carey's Chicken.' The name 'petrel' means Little Peter, in reference to its habit of skimming closely to the surface of the sea, dipping its feet in the water as if walking. It breeds on the western coast of Europe, and also in the Mediterranean; in the British Isles it nests chiefly in the northern Scottish islands, parts of Wales, and the Channel Islands. The nest consists of weeds placed in a hole in a cliff or under stones on the beach. Only one white egg is laid.

The Storm-Petrel is only six inches in length, and except for a white patch at the root of the tail is mainly sooty black in colour. It delights in gloom, and consequently when a storm is brewing

and the sky is overcast, it leaves its hiding-place on land, or wakes from its sleep on the surface of the water, in readiness for the marine creatures that the chopping waves will fling to the surface. Thus it comes about that the bird is viewed as an ill-omened herald of a storm, and around it are weaved all kinds of nautical superstitions.

This bird possesses a singular amount of oil, and has the power of throwing it from the mouth when it is terrified. The inhabitants of some of our lonely northern islands make a curious use of this and the succeeding Petrel, when they are young and very fat, by simply drawing a wick through the body, and lighting it at the end which projects from the beak.

The Fulmar Petrel (*P. glacialis*) is three times larger than the last-named bird. It is usually white on the head, breast, and underparts, the back, wings, and tail feathers being different shades of grey. The main breeding-stations of the bird are in the far north, but in St. Kilda it nests in great colonies, and in the Hebrides and Shetland Islands it is increasing in numbers. The Fulmar Petrel is an assiduous attendant on whaling ships; and its greed leads it to collect in thousands, and to advance fearlessly, close up to the men who are engaged in cutting out the blubber.

The Giant Petrel (*Ossifraga gigantea*) is over two feet and a half long, and has a wing-spread exceeding five feet, with powers of flight almost equal to the Albatross. It is chiefly slaty brown in colour, with various tinges of chocolate and grey. It makes its home principally in southern latitudes, breeding in such lonely spots as Kerguelen and Prince Edward's Island. "This petrel soars all day along the coast on the look out for food, and is evidently well acquainted with the usual proceedings of the sealers, who kill the sea-elephant, take off the skin and blubber, and leave the carcass. No sooner is an animal killed than numbers of birds appear as if by magic, fighting among themselves for the first bite."

ORDER: PYGOPODES

THE DIVING BIRDS

The birds grouped in this order have their short legs placed far backwards, while the first toe, if not absent altogether, is very rudimentary, and the front toes are either lobed or fully webbed. The bill is very much compressed and the wings are short. The food consists chiefly of fish which the birds capture by diving.

In some cases the young are born with feathers, and in any case quickly take care of themselves, whereas the young Albatrosses are particularly helpless. Naturalists differ in their classification of these birds, and often the Divers and the Grebes are accounted as forming distinct orders.

FAMILY: ALCIDÆ

THE AUKS

The auks, guillemots, razor-bills, and puffins form a family group of purely pelagic birds, that are related, in different degrees, to the gulls and plovers. They are largely restricted to the colder northern waters; they do not extend into the tropics, nor are any of them found in the Southern Hemisphere.

The Puffins, or Sea Parrots, are remarkable not only for the shape and light colours of the beak, but also for its enormous size, as if originally it must have been intended for a much larger bird. The



PUFFIN

Common Puffin (*Fraterecula arctica*) during the breeding season ranges from the west coast of Spain to North Cape, but in winter the Mediterranean is a favourite resort. The white sides of the head, in sharp contrast to the black crown and gorget, the bluish-grey beak striped with orange, and the legs and toes of the same colour, make up a most odd-looking bird. In the British Isles the Puffin breeds in the cliffs and upon rocks, often annexing rabbit-warrens near the sea, or digging out a hole for itself in which to lay its single white egg, spotted with brown or lilac. During the breeding season the beak takes an extra brilliancy of colour, but in the autumn moult the coloured shields fall off and greatly reduce the bill in size.

The Puffin can fly rapidly and walk tolerably, but it swims and dives supremely well, chasing fish, and often bringing out a whole row of sprats at a time ranged along the side of its bill, the heads being within the mouth and the tails dangling outside. A couple of birds will defend their nest vigorously. The raven is the most frequent assailant, but very often comes off second best. If the Puffin can grip its enemy with its sharp-edged bill and hold on until it can tumble the black depredator into the water, all is well; but if the raven can keep to the shore, its superior size and weight will gain the day.

The Little Auk (*Alle alle*) is a frequent winter visitor to Britain, although in all probability it seldom, if ever, comes except when driven by stress of weather. It is not more than seven inches in length; it is almost black above, from its bill to the tip of its tail, except for two white bands across the wings; and all the under surface is white.

In appearance the Great Auk (*Alca impennis*) or Gare-fowl, generally resembled the penguin, possessing small flappers for wings quite useless for flight. Melancholy interest attaches to this bird, for within the memory of living man it has become absolutely extinct. It was formerly found in the North Atlantic, breeding especially in several rocky islands near Iceland and Funk Island, off Newfoundland. In the latter the Great Auk is said to have been slain in millions for the sake of the feathers. The last pair of birds was killed off Iceland in 1844, and now nothing remains to us of the finest of the Auks except a few treasured skins and eggs, which realise remarkably high prices when they come into the market.

The Razor-bill (*Alca torda*) is often mistakenly called the 'Puffin,' which it rather closely features, except that its furrowed bill is less obtrusive; but in reality it has a still greater resemblance and not a little relationship to the great auk. It breeds on many rocky coasts between the English Channel and the north of Scandinavia. Yarrell says: "Early in April in the northern portions of our islands, the razor-bills, guillemots, and puffins, converge to particular points, where, from the numbers that congregate, confusion of interests might be expected. It will, however, be found that, as a rule, the birds occupy different lines of ledges on the rock. The Razor-bills generally select the higher and rougher ledges, and they are partial to crevices, their eggs being sometimes deposited so far in that it is no easy matter to get at them."

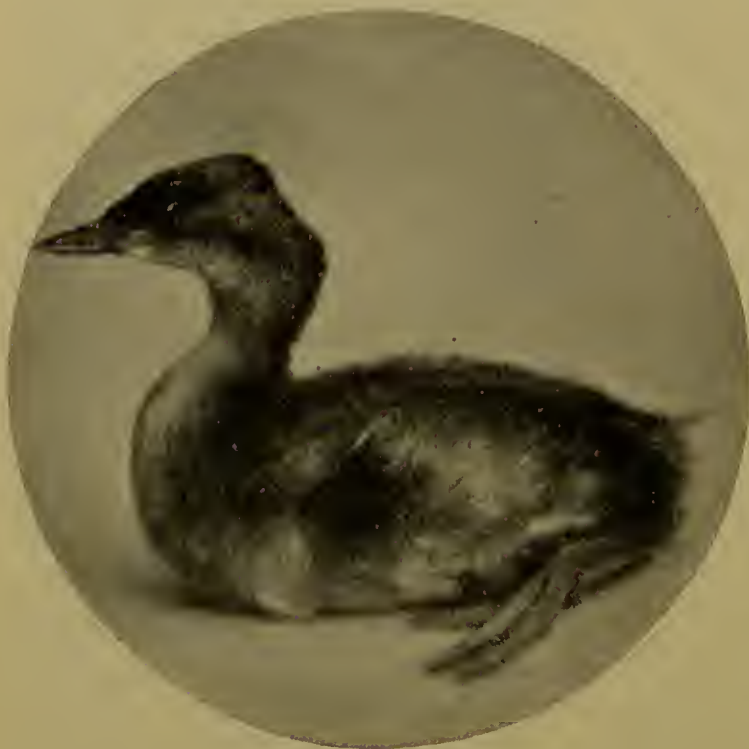
The Common Guillemot (*Uria troile*) keeps too well out to sea to be known to the average seaside visitor. It is about eighteen inches in length. Its beak is long and pointed. The upper plumage is brownish black, except for the white-tipped secondaries; the under plumage is white. In spring the Guillemot resorts to lofty cliffs at many points round our coasts. The neighbourhood of Flamborough Head is a well-known nesting location, but Iceland, Farøe Islands, the Orkneys, and St. Kilda are where the bird congregates in greatest numbers, laying its single, rough, thick-shelled egg on the bare rock. The egg and feather harvest is of great importance to the inhabitants, who also salt down the young birds for winter consumption. The bird is commonly known as the "Foolish Guillemot," because of its singular indifference to the egg-gatherers. It refuses to leave its charge, and is knocked on the head, netted or noosed with the greatest ease; for although the eggs and young birds are the chief aim of the collectors, the parents are taken for the sake of their feathers.

FAMILY: PODICIPEDIDÆ

THE GREBES

In the temperate regions of both hemispheres there are quite two dozen species of Grebes, of which five are known to the British Isles. The form of the foot is peculiar, each toe being furnished with a separate flattened web, giving the whole foot the appearance of a horse-chestnut leaf with three lobes. When diving, the birds propel themselves through the water by means of their toes, and not like some of the auks, which utilise their wings to get below the surface. Unlike the preceding birds of this order, the Grebes breed exclusively in fresh water, some of them never know any other habitat, while others are oceanic only during certain periods of the year.

The Little Grebe, or Dabchick (*Podiceps fluviatilis*), is the commonest and smallest of the British species. It is a pretty little bird, quick and alert in its movements. When alarmed, it dives so



LITTLE GREBE

instantaneously that the eye can hardly follow its movements.

Like many other aquatic birds, it can sink itself in the water slowly. In its summer plumage the head, neck, and upper portions of the body are dark brown, except the secondaries, which are white; the sides of the face are warm chestnut, and the under surface is greyish white. The nest of this bird is made of water-weeds, and is anchored to rank aquatic herbage. It is scarcely raised above the surface,

and is mostly wet. The eggs are five or six in number, and their normal colour is white, though they soon become stained by the decaying vegetable matter upon which they rest.

The Great Crested Grebe (*P. cristatus*) is a bird twenty-one inches in length. Its cheeks, breast, and underparts are white; its crest, ruff, and upper plumage are dark brown and chestnut. The feathers of the beautiful silvery white breasts of the Grebes are

largely used for muffs and dress trimmings. The Great Crested Grebe frequents reedy sheets of water almost throughout the kingdom, feeding on fish, frogs, crustacea, etc. ; but in winter it repairs to the sea, not so much for food as to avoid being frozen up. The nest is placed among reeds and rushes ; the four eggs are white. The young birds can swim and dive immediately after they are hatched.

FAMILY : COLYMBIDÆ

THE DIVERS

There are five species included in this Arctic and sub-Arctic family, two of them nesting within our borders, and two visiting us only in winter. In appearance on the water they would easily pass for geese, but on land the backward position of the legs instantly betrays their affinity with the preceding birds. The Great Northern Diver (*Colymbus glacialis*) breeds in the Shetland Isles, but comes no further south until winter. The total length of the bird is not quite three feet. Its head is black, glossed with green and purple ; its back is black, variegated with short white streaks, and the neck and upper part of the breast are white, spotted with black ; the breast and abdomen are white. The 'Ember Goose,' as the bird is also called, lives chiefly upon fish, finding a rich harvest in shoals of sprats and herrings ; and not unfrequently it is so intent upon a capture that it gets entangled in fishing-nets. The nest consists of only a little flattened herbage near water, and very often the two dark, olive-brown eggs, spotted with brown of another shade, are laid upon the bare ground. If disturbed, the bird scrambles into the water and dives away, keeping out of gunshot until the danger is past ; but if she is driven to fight she darts her long beak at the foe with great force and rapidity.

ORDER : IMPENNES

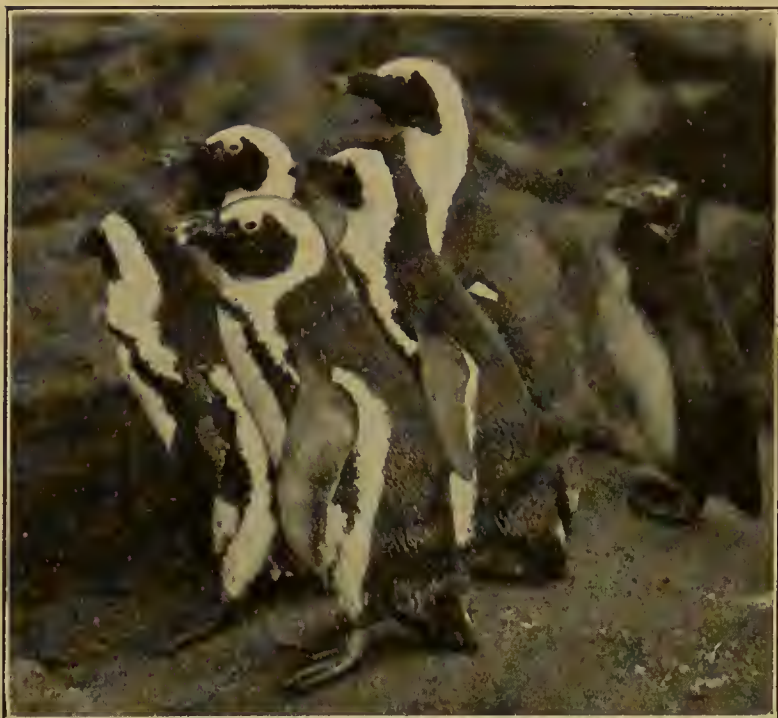
THE PENGUINS

The Penguins form a remarkable group of birds, breeding in lonely spots in the Southern Ocean, extending as far north as the equator only in the Pacific. There are nearly a score of species, all having their wings modified into paddles, useless for flight, but serving as capital oars for progression in the water. Their legs are enclosed in the skin of the body, and the big, clumsy feet are placed so far back as to make locomotion on land a slow and almost painful operation. The birds, however, often resort to all fours, and when crawling through the tussocks, or on the side of a grassy cliff, at a distance they may easily be taken for quadrupeds. There is, perhaps, no stranger sight in the bird world than a party of Penguins tobogganing down a slope. When they are pursued on land they lie down flat upon the belly, and work both feet and wings in their desperate

efforts to escape. In the water any Penguin is thoroughly at home. It is an expert diver, the little plumeless wings, clothed only with narrow, scale-like feathers, being used as fins, which are worked alternately, while the feet act as a rudder. Darwin said that when at sea and fishing, the bird comes to the surface for the purpose of breathing with such a spring, and dives again so instantaneously,

that quick sight is needed to assure one that it is not a fish leaping for sport.

The photograph shows a group of adult Cape Penguins (*Spheniscus demersus*) together with one bird of immature plumage; and renders verbal description unnecessary. All of the species are very gregarious, assembling in thousands, forming great rookeries, the



PENGUINS

eggs being placed so close together that it is impossible to walk without treading on them. From Jutten and Dassen Islands 30,000 eggs are sometimes despatched to Cape Town in a single day. Young Penguins are good eating, but the flesh of the old birds is dark and tough. In the Antarctic regions these strange birds are remarkably fearless, and Sir Ernest Shackleton found that they were greatly attracted by the sounds of the gramophone with which the members of the exploration party whiled away the long tedious evenings. These birds were Emperor Penguins (*Aptenodytes forsteri*), the largest of the whole order, standing nearly three feet and a half high, and sometimes weighing nearly eighty pounds; but even this size is dwarfed by the remains of prehistoric Penguins of New Zealand, which apparently exceeded six feet in height.

The Order Impennes concludes the sub-class of Carinate Birds, most of which, as stated in earlier pages, have a strong keel (carina) to the breastbone for the attachment of the pectoral muscles with accompanying power of flight.

SUB-CLASS RATITÆ
THE FLIGHTLESS BIRDS

All of the birds previously described possess a more or less keeled breastbone to support the muscles necessary for flight. Though the penguins are really flightless birds, they use their wings for progression in the water, and also in a lesser degree as legs, and, therefore, have the usual breastbone of the Carinates. But the birds now awaiting consideration are chiefly large birds, with wings so greatly reduced that flight is impossible; and in all cases the breastbone lacks the keel. The term Ratitæ is derived from the Latin expression for a flat-bottomed boat; but another name for these birds is Cursores or Running Birds, on account of their great speed of foot. Their legs are developed to an extraordinary degree, the bones being long, stout, and nearly as solid as those of a horse.

FAMILY : STRUTHIONIDÆ
THE OSTRICH

The Ostrich, the largest of all existing birds, is a native of the hot, sandy deserts of Africa and Arabia. Whether there is really more than one species is doubtful, but the more common type (*Struthio camelus*) has a flesh-coloured naked neck, whereas that of the Somali Ostrich (*S. molybdophanes*) has a bluish tint. In height the male bird measures from six to eight feet. The most noticeable features, apart from size, are the comparatively small and flattened head; the broad and short, depressed beak; and the foot, in which the first and second toes are completely missing. The third toe much exceeds the fourth in size, and both are padded underneath. The plumage of the male in any species is chiefly black, with white wings and tail; the female is brownish grey. The feathers of the wing and tail have their two webs of equal width, and their slender stems and disunited barbs form plumes with an elegance all their own.

The Ostrich is very gregarious, associating in flocks, and frequently consorting with zebras, giraffes and antelopes. It is polygamous, each male taking from two to seven wives. The nest is a mere hole scooped in the sand; a larger number of eggs is laid than are incubated, the remainder serving as food for the newly hatched young. In the hotter regions the eggs are covered with sand, and left to the heat of the sun during the day; but at night the male bird sits upon them to protect them from jackals and other enemies.

Until the year 1865 Ostrich feathers were only obtainable by hunting and killing the bird. This was by no means an easy task, for it is keen-sighted, wary, and of matchless speed; and but for its habit of running more or less in a circle its capture would be

very problematical. For the sake of the valuable feathers, however, black hunters and white unceasingly sought the bird in its desert haunts, and it was in danger of extermination. The farmers of Cape Colony commenced to domesticate the Ostrich, and now



SOMALI OSTRICH

there are many thousands of birds on the farms, yielding feathers for export to the value of nearly a million pounds sterling per annum. Seven to eight guineas per lb. is an ordinary price for good plumes, but as much as £30 is given for specially fine ones. The birds are denuded of their feathers every season, and there is now little fear of the Ostrich becoming extinct, or the supply of feathers failing. In Australia and California Ostrich-farming has proved very successful.

Of various more or less allied birds may be mentioned the Rhea (*Rhea americana*), but belonging to a different family, the Rheidæ. It is often called the South American Ostrich, but it is much smaller

than its African ally, and has three toes and a fully feathered head and neck. It is a swift-footed bird, but possesses little presence of mind, and when chased, runs aimlessly about, giving the hunter time to shoot it, or bring it to the ground by means of the entangling *bolos*. It is easily acclimatised, and is often to be found in English parks. Rhea feathers are of practically no commercial value.

The Emu (*Dromæus novæ-hollandiæ*) is one of two species forming the family Dromæidæ. In form and many of its habits it more resembles the ostrich than the last-named bird. It inhabits chiefly the plains and open forests of Central Australia, but in recent years it has become increasingly scarce. When chased and brought to a standstill, it deals out violent kicks fiercely around, delivering the blows sideways and backwards like a cow, whereas the ostrich always viciously kicks forward. In height an adult bird stands five feet ; in colour it is lightish brown and grey, and the feathers are very loose and quite hairy in appearance.

The Cassowary (*Casuarius australis*) is one of nearly a dozen species restricted to Australia, New Guinea, and neighbouring islands. Like the rhea and emu it has three toes to each foot, but the wing is so small as scarcely to be visible externally. The male bird is five feet in height, and its black plumage appears to consist of shining horse-hair. It wears a helmet, glossy black in colour, while the upper part of the neck is light azure, purple, and scarlet.

The Kiwis are the smallest of the Flightless Birds. There are three or four species in the family Apterygidæ ; all of them are



KIWI

natives of New Zealand ; and the largest of them, Shaw's Kiwi (*Apteryx australis*), rarely exceeds twenty-seven inches in length. It possesses scarcely the slightest trace of wings, and its feathers have no aftershaft. The bird is stoutly built, and has a very long beak, which sometimes it rests upon the ground to assist in supporting itself. In habit it is as nocturnal as the owl, only going abroad in the twilight in search of food, making a sniffing sound as it forages for worms. It moves about slowly and noiselessly, driving its flexible bill into the soft ground to its very root, and rarely withdrawing it without the worm for which it seeks. The New Zealand native chiefs set great value upon the hair-like plumage of the Kiwi, which they use for their state mantles.

REPTILES



CLASS : REPTILIA

THE REPTILES

UNDER the general title of Reptiles are classed many remarkable creeping and crawling animals, although all of its members do not creep. They are spread over those portions of the globe where the climate is tolerably warm, increasing in profusion towards the hottest regions. A few of them are inhabitants of dry and burning deserts, but the majority of the Reptiles prefer wet and swampy regions, and in the rivers and morasses of the tropics the very soil appears to teem with their strange and varied forms. Not a few of these creatures are semi-aquatic in their habits, and are constructed for progression on land or in water, and able to pass a considerable time below the surface without requiring to breathe.

In the Reptiles the heart is considerably modified, consisting of only three chambers, one ventricle, and two auricles. This causes the blood to be less perfectly aerated and much colder than in the higher animals, the freshly oxygenated blood as it returns from the lungs mixing to some extent with the venous blood which has traversed the body. In the crocodile the ventricle is partially divided, and practically gives the creature a four-chambered heart, but, nevertheless, there is still some mingling of the fresh and the effete blood. In consequence of this imperfect aeration of the blood, Reptiles are generally marked by dull sluggishness, for though a few of them whisk about with lightning speed, and can be lashed into a frenzy by love, rage, or hunger, their ordinary movements are inert, their gestures express no feeling, and their eyes, although bright, are stony and passionless.

Most of the Reptiles possess four legs, but few are supported wholly upon them, their bellies reaching the ground, and being dragged along by the limbs ; the members of one great division of the order are altogether devoid of legs ; and a few species can support themselves in the air for a short distance, after the fashion of the flying squirrels. With the exception of the tortoises, the Reptiles are armed with a goodly array of teeth, sharp and, more or less, curved backwards. Generally they border the jaws, but in some instances they are spread over a great portion of the palate ; and the teeth are not replaced continuously, but irregularly, throughout the period of life. The typical reptilian body is covered with scales and plates of various forms ; in some cases the scales overlap each other like those of the fish ; in others they are modified

into knobby plates ; and in the tortoise and turtle they form large, flat plates on the back and breast, and scales upon the feet and legs.

With few exceptions the Reptiles are carnivorous, and some of the largest of them are the most terrible of rapacious beings. Among them we find, what we failed to encounter among the furred and feathered animals, namely, creatures whose chief offensive weapon is poison.

The young of Reptiles are produced from eggs, mostly hatched after they have been laid, but in some cases the young escape from the eggs before they are laid. But all young Reptiles at birth assume the form of the parent ; they do not, for example, pass through a gill-breathing stage like the Amphibians, which are often popularly confounded with the Reptiles. Usually the eggs are placed in a convenient spot, where they are hatched by the heat of the sun. Some species are very jealous about their eggs, keeping a strict watch over them, but others ignore them completely when once they are deposited in a hiding-place. The size of the eggs is very variable. They are often large in proportion to the dimensions of the parent ; but those of the crocodile are comparatively small, as will be seen in the photograph of three eggs to indicate their relative sizes.



INDIAN PYTHON'S EGG

HEN'S EGG

CROCODILE'S EGG

In form, and often in colour, the Reptiles exhibit an inexhaustible variety ; and each order displays a diversity of outward aspect, unexampled in the Mammals and the Birds. Even when the creatures are not particularly strange, grotesque, or repulsive in appearance, Reptiles excite irrepressible repugnance in the human breast. It may be that their cold-bloodedness is instinctively associated with death, although fishes do not inspire such aversion ; but whatever the cause, the feeling is deep-rooted and universal.

In long past ages there were at least nine orders of Reptiles,

but more than half of them have become extinct. The existing orders are :

1. Crocodilia . . . Crocodiles.
2. Chelonia . . . Tortoises and Turtles.
3. Squamata . . . Lizards (Sub-order : Lacertilia).
Chamæleons (Sub-order : Rhiptoglossa).
Snakes (Sub-order : Ophidia).
4. Rhynchocephalia. Beaked Lizards.

ORDER : CROCODILIA

THE CROCODILE TRIBE

The members of the order, whether they be the true crocodiles, gharials, caimans, or alligators, form but a single family. They are the largest of the Reptiles, and on account of their strength, voracious and carnivorous appetite and terribly armed jaws, are the dread of the countries where they make their home, ruling the rivers with a sway as despotic as the lion and tiger exercise on land, the eagle in the air, or the shark in the sea.

The Crocodile is typical of the whole group. It is hideous in appearance, the huge lizard-like form scarcely being raised from the ground by the short legs, which are furnished with webbed feet, the front limbs being armed with five clawed toes, and the hinder feet with four. The tail, long, compressed, and powerful, is the swimming propeller, and is also used as a terrible weapon of offence. The upper parts of the body are covered with square, keeled, bony plates embedded in the skin, an armour-like protection, far harder than the skin of the elephant and rhinoceros, and only penetrable by hardened bullets. The head is always rather elongated, and in some species is developed into a narrow and prolonged snout. The eyes are large and are provided with a thin and transparent membrane, which can be drawn over them like a curtain when under water, without impairing the vision ; and as they are placed on the top of the head, the Crocodile can see when submerged. The nostrils, at the very extremity of the skull, are fixed upon a prominence, so that the reptile can breathe by exposing merely an inch or so above the water, being concealed from a foe, or well placed for making an unexpected snap at its prey. This peculiar formation of the nostrils also enables the Crocodile to hold the head of its victim under the water, and yet leaving itself perfect freedom to breathe. Nor does water run down the throat in such a situation, for the opening of the mouth automatically closes thin cartilaginous plates at the back of the throat, while a pair of tightly closing valves similarly guard the ears. The teeth are sharp and conical, and set along the margins of the jaws. It is the fourth tooth on either side of the lower jaw that decides whether a creature is a

Crocodile or an Alligator. In the first-named, this tooth coincides with a notch in the upper jaw, but in the latter it fits into a pit.

On land the Crocodile is awkward and clumsy, but in the water it is thoroughly at home, and in pursuit of prey some species are capable of extraordinary speed. In one respect the monster is placed at a disadvantage. The vertebræ of the neck are furnished with short transverse processes, which prevent the animal from turning its head from side to side, and as its legs are inadequate to support the long and heavy body, its onset on land can easily be avoided by anybody possessing ordinary agility.

The eggs are usually laid in a hollow two feet deep, and with undermined walls, to which points the eggs roll. The hole is then filled up and the mother sleeps on the top of it. This method of secreting the twenty to thirty eggs rather discounts the statements concerning the partiality of the Mongoose for the reptilian albuminous dainty. In many parts of the world, however, the natives utilise the eggs for food ; and Mr. Joseph in his " History of Trinidad " asserts that he had eaten caiman eggs without knowing what they were, and found them very good. Just as a chicken chirps before breaking out of the shell, so the young unhatched Crocodile vents distinct cries, upon which the mother digs down to the eggs, and when the young make their appearance, leads them to the water. It is an astonishing fact that a young Crocodile is eleven inches long when freed from an egg that barely exceeds three inches in length ; and even at that early stage the little creature will snap at a finger with the inborn ferocity of its race.

THE TRUE CROCODILES

The true Crocodiles are found in both the Old and the New Worlds, and are divided into groups according to the shape of the head. The Indian, or Marsh, Crocodile (*Crocodilus palustris*), commonly called the ' Mugger,' is a broad and short-snouted species that inhabits the rivers and swamps of India, Ceylon, Burma, Malacca, and the Malaysian Archipelago generally. Twelve to fourteen feet is about the average length now attained by this creature, but in the British Museum is a skull twenty-six inches in length which belonged to a reptile that was probably thirty-three feet long. Though neither the largest nor the most ferocious of the family, every year it takes a fearful toll of human life, especially preying upon women and children stooping down to dip for water from river margins, and always bathers who venture incautiously into infested waters.

The Hindus reverence the ' Mugger,' and sometimes it is kept in a state of semi-domestication. At Maggar-Pir, eight miles from Karachi, is a swamp where a number of sacred reptiles have been preserved and fed for long ages. Commander Carless described it sixty years ago, and it has remained practically unchanged. Within

a confined space, some 150 yards long by 80 yards wide, were a couple of hundred Crocodiles, attended by a holy fakir, who, for liberal backsheesh, killed a goat and fed his charges. "The animal was slaughtered on the edge of the swamp, and as soon as the blood began to flow the water became perfectly alive with the repulsive brutes. Upwards of a hundred and fifty of them collected in one horrible mass on the dry bank. When the meat was thrown among them, it proved the signal for a general battle. Several seized hold of a piece at the same time, and bit and struggled and rolled over each other until almost exhausted with the desperate efforts they made to carry it off."

Such a ghastly feast may be witnessed by the present-day visitor.



BROAD-FRONTED CROCODILE

Miss M. M. Becker says, that she was introduced to the 'Chief,' a large Crocodile who lives alone and will not permit the common herd to intrude on his solitary state; and paid her respects to 'Mor,' the Peacock, who is twenty-one feet long and still growing. Among the hundreds of Crocodiles gathered together at Maggarir many have been maimed through the onslaught of their enemies, or in the struggle for existence. I was particularly interested in one huge, fat old mugger who had lost a limb, but managed to paddle about quite briskly in the muddy water with the remaining one. Some of his companions had broken noses, others had lost the tips of their tails. Others, again, were toeless, while several were blind in one or both eyes—yet there they lie as they did when visited by Alexander the Great." General Nicholson, when a young lieutenant,

wagered that he would cross the lakes at Maggar-Pir on the backs of the sacred Crocodiles. He passed from one ghastly stepping-stone to another in safety, thanks to the stiff-necked conformation of the reptiles, which does not allow of easy turning upon their prey. Nevertheless, the voracious creatures at various times claimed so many victims, that the British authorities insisted upon a low mud wall being erected around the loathsome spot.

The Estuarine Crocodile (*C. porosus*) has a more elongated snout; the reptile is quite commonly twenty feet long, and a length of thirty-three feet has been recorded. It frequents the tidal estuaries of the Bay of Bengal, and ranges eastwards to Southern China; and it is often seen at sea at a considerable distance from land. This huge and particularly ferocious creature is the man-eater of the tribe, and the natives ascribe to it no holy qualities, but despatch it whenever the opportunity occurs.

The Nile Crocodile (*C. niloticus*) is very little smaller and almost equally dangerous. Steamboat traffic, and particularly the modern rifle, have freed Egypt from the monster; but in the upper reaches of the river it is as abundant as ever. Many instances are known where men have been surprised near the water's edge, or captured when they have fallen into the river. It is said that there is only one way of escape from the jaws of the Crocodile, and that is to turn boldly upon the scaly foe and press the thumbs into its eyes, so as to force it to relax its hold or relinquish the pursuit. The ancient Egyptians worshipped the giant reptile. Priests bedecked selected animals with precious stones, rings, bangles, etc. When the sacred creatures died they were embalmed, and many crocodile mummies have been unearthed in recent times. It is a common habit of all Crocodiles to lie asleep on mud-banks with the mouth wide open. The Nile Crocodile allows the Egyptian Plover (*Pluvianus ægypticus*) to enter between its jaws to clear the mouth of insects, leeches, etc., which infest the cavernous opening.

The Crocodiles of Western Africa, such as the Broad-fronted Crocodile (*Osteolaemus tetraspis*), and others of Central and South America do not call for specific mention, but the Gangetic Garial (*Garialis gangeticus*) differs from all other species in sundry particulars: it attains a length of twenty feet; it has a long, narrow, beak-like snout, and its hinder legs are much longer than the forelimbs. It is the most aquatic of the whole group, living almost entirely upon fish, and human beings, and the larger mammals are rarely, if ever, attacked.

THE ALLIGATORS

The Alligators and Caimans are very closely allied, and both are distinguished from the crocodiles by the fourth lower tooth fitting into a socket, instead of a notch, in the upper jaw. Caimans simply swarm in the rivers of Central and South America. The

Great Caiman (*Caiman latirostris*) attains a length of twenty feet and a bulk out of the ordinary, and the Rough-eyed Caiman (*C. sclerops*) is very little less in dimensions. Mr. Bates said that some of the South American rivers are "as well stocked with Alligators as a ditch in England is in summer with tadpoles." The Indians capture Caimans by means of baited hooks, which is a common method of catching any of the Crocodile tribe, whose flesh is eaten in many regions by the natives. It has somewhat



ROUGH-EYED CAIMAN

the appearance of veal, but is musky in odour, and Europeans who have tasted it, report it to be tough, greasy, and fishy.

Mr. Frederick Singer describes a thrilling Alligator hunt in which he participated in Panama. In a creek the party "suddenly came upon a vast stretch of mud which was entirely covered with a living mass of basking Alligators. No one in either boat had ever seen such an astounding spectacle before. Certainly one could have walked on the reptiles without touching the mud itself." The boats had grounded on a falling tide, but the hunters did not account it of much importance and opened fire upon the creatures, not realising that their boats and themselves were between the great 'herd' of Alligators, and the river behind.

“ It was really a horrible predicament, because no sooner had every man discharged his rifle than the whole hideous herd advanced. Our two boats in a large measure blocked the creek, and they were stuck on the mud. Hundreds and hundreds of the repulsive creatures were crawling down upon us rapidly from the mudbank, their long tails trailing in the slimy ooze, and their snouts ploughing up the mud as they advanced. On the right-hand side of us nine or ten of the largest Alligators lay in their death agonies, lashing the reeking mud with their tails. Presently the reptiles, finding themselves hemmed in, began to lash the few inches of water which in some places still covered the mud. From every side a perfect hail of foul-smelling green and black mud poured in upon us, and in a minute or two the boats were half-full of blood and filth. But slowly and surely the loathsome torrent of Alligators surged past, and so great was their hurry that sometimes one of the smaller reptiles would actually be shoved into a boat, and we would have to fall back and kill the brute by a shot through the eye or under the shoulder.”

When at last the boats floated, the party was glad to see the last of that awful river, every man getting a touch of fever or ague through breathing the tainted atmosphere of the churned-up mud.

The American Alligator (*Alligator mississippiensis*) inhabits the Mississippi, and other rivers of the Southern States of North America. It avoids salt or even brackish water, and is mostly a fish-eater, diving under a passing shoal, snapping up one or two victims as it passes through them, tossing them in the air for the purpose of ejecting the water, which has necessarily filled its mouth, and then catching them adroitly as they fall. It is, however, a fierce and dangerous reptile to human beings, appearing to know when a man is off his guard. It is no easy matter to drive the breath out of an Alligator or any other of the Crocodile tribe, for life seems to take a separate hold of every fibre in the creature's body, and though pierced through and through with bullets, and speared in many places, it will writhe and twist, snapping direfully with its huge jaws, and lashing its muscular tail from side to side with such vigour that it takes a bold man to venture within range of the weapon. The armoured hide of any of these reptiles is not bullet-proof as commonly supposed, but a really effective shot must touch the brain or the spinal cord of the neck; and the creature's most vulnerable spot is the aperture behind the ear. The Crocodiles and Alligators are unarmoured on the under surface of the body, and in some regions the natives skilfully dive beneath the reptiles and inflict death-wounds from below; but the Caimans are protected on the underparts by a plating of small shields. As might be expected, the American settlers have destroyed the Alligator by thousands, not only on account of its depredations, but also for the commercial value of the hide. But, as remarked elsewhere,



PLATE XX
Pond Turtle
Green Turtle
Mississippi Alligator



the wholesale destruction of any particular creature interferes with the balance of Nature, and the disappearance of the Alligator in some regions has been followed by a marked increase in snakes and musk rats.

ORDER : CHELONIA

THE TORTOISES, TERRAPINS, AND TURTLES

The bony shell which invests the body of these reptiles easily distinguishes them from any other members of the Reptile class ; and they are worth critical examination on account of their really unique position among all living creatures.

The Tortoise is the first example of an animal with its skeleton brought to the exterior of the body, although in the lower orders this formation is of frequent occurrence. The shell consists of two portions, namely, the upper part, or carapace, and the lower part, or plastron. The carapace is formed by a remarkable development of the vertebræ and ribs, which throw out flat processes that are joined together by sutures like the bones of the skull. The back is therefore incapable of movement, and its arched shape gives it wonderful strength when it is resting on the ground. The plastron is similarly formed of the breastbone. At the front of the inflexible shell is an aperture through which protrudes the head, neck, and fore limbs ; an opening at the other extremity accommodates the hinder limbs and the tail.

Naturally the rigid walls of the shell necessitate various modifications of structure. The shoulder-blades, for example, are situated within, instead of outside, the ribs ; and no expansion of the chest is possible in breathing, the lungs being filled and emptied by the piston-like movements of the neck and limbs. The fore limbs are strong for digging, swimming, or climbing steep ascents. In some cases each of the five toes of the feet is furnished with a strong, curved claw, but in others only three toes are clawed. The hind feet of the Land Tortoises are club-footed, and very often some portions of the legs are protected by bony plates ; but in the case of the Turtles the limbs are modified into swimming-paddles, recalling to mind the flippers of the seals. The jaws contain no teeth, but their edges are sharp and horny, forming a short cutting beak.

The neck of any Chelonian is always rather long, and in some species is capable of remarkable extension. Usually the process of thrusting the neck from the shell is a slow one, but its withdrawal is marvellously rapid, chiefly owing to long muscles, which tie the neck to the back of the carapace. When the creature is thus drawn within its castle, those portions of the head and limbs that the apertures leave exposed are protected by horny shields. Some Tortoises, however, are provided with an additional defence, and by means of hinges at the ends of the carapace or plastron, the apertures can be effectively closed, so that the creature is boxed in and,

figuratively, can laugh at many of its enemies in search of a succulent meal.

FAMILY: TESTUDINIDÆ

THE LAND TORTOISES AND TERRAPINS

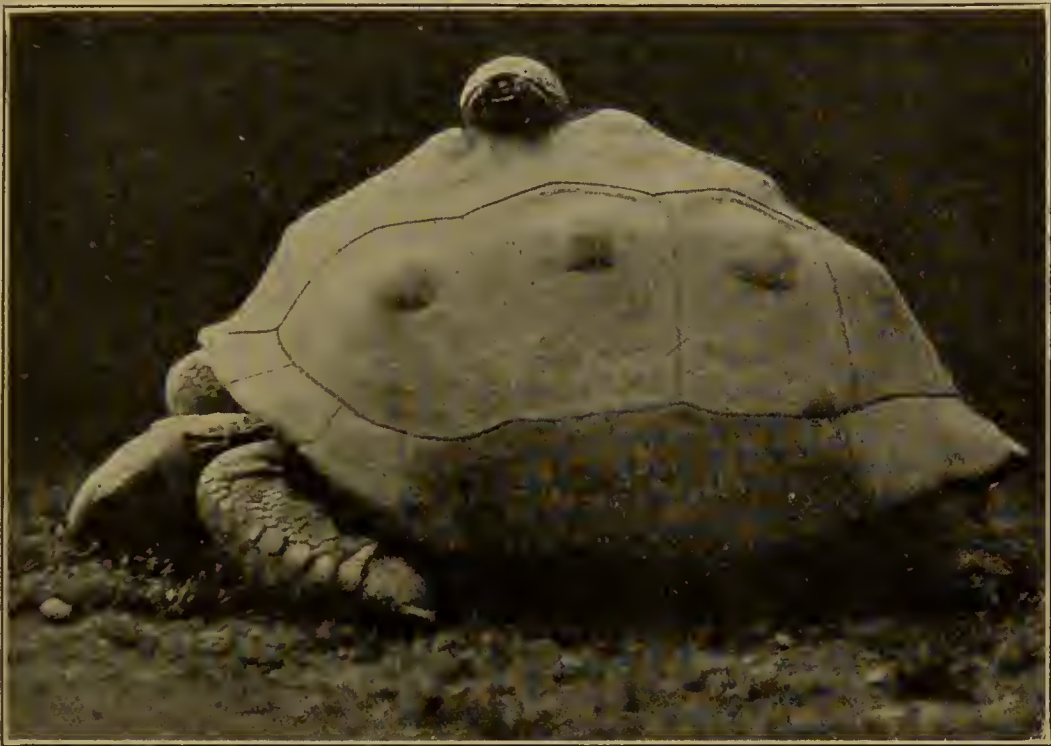
One of the best-known species is the Greek Tortoise (*Testudo græca*) so frequently exposed for sale in our markets, and so favourite an inhabitant of our gardens, under the erroneous impression that it will kill insects, etc. Like most Tortoises it is a vegetarian; and it has an unerring taste for the choicest lettuces and the most cherished flowering-plants that adorn the suburban garden. It is only about five inches and a half in length, and is a native of South-eastern Europe, especially Italy, Sicily, and the Grecian Archipelago. Other popular species, and very similar reptiles, are the Algerian Tortoise (*T. ibera*) from Algeria and Southern Andalusia, nine inches in length; and the Margined Tortoise (*T. marginata*) which is practically confined to Greece. These three species are sent to England by the shipload, and so many in number that one wonders what becomes of them. In their native regions they are sold in the markets, principally for making soup.

Various species of Tortoise may be dismissed briefly. The Brazilian Tortoise (*T. tabulata*) of tropical South America has rather an elongated dark brown or black shell, its shields showing a yellowish centre, while the dark head and limbs are decorated with red or orange spots. This tortoise often forms a toothsome meal for the jaguar and the puma, either of which digs the creature in pieces out of its shell, or wrenches the carapace and plastron completely apart. Most species conceal themselves under shrubs and tufts of grass, or bury themselves in holes in the ground during hibernation; but the Gopher Tortoise (*T. polyphemus*) lives in a burrow four feet long with a living-chamber at the end of it. This species is easily caught by digging a hole in front of the entrance to its burrow; it falls into the pit and is effectively trapped. Most of the tribe are used for food by the natives of the regions which the creatures inhabit.

In certain islands, such as Aldabra and Mauritius in the Indian Ocean, and the Galapagos Islands in the Pacific, large Land Tortoises existed in immense numbers, until ships commenced to call and carry them off by hundreds at a time, as well as collecting large quantities of eggs. In the Zoological Gardens, London, are several gigantic tortoises (*T. elephantina* and *T. gigantea*). Some of the specimens are from the Aldabra Islands, but the largest came from one of the Galapagos Islands. This creature, which is said to be over a hundred years old, is three and a half feet long, two and a half feet high, and weighs nearly 800 lbs. The largest-known specimen was in the collection of the Hon. Walter Rothschild; it measured four and a half feet from end to end, but its weight

was only 560 lbs. In the photograph an average-sized Grecian Tortoise is shown on the back of its elephantine cousin for the sake of comparison.

The Hinged Tortoise (*Cinyxis belliani*), a native of tropical Africa, has a shell only seven and a half inches long. It is one of several species that have the hinder part of the carapace movable by means of a ligamentous hinge, so that when the creature withdraws into its shell, the hinder aperture can be closed up. The Carolina Box-Tortoise (*Cistudo carolina*) is one of various North American forms with a shell six inches in length. In this case it



ELEPHANTINE TORTOISE

is the plastron which is hinged, before and behind ; and thus the shell can be closed completely, hence the name ' Box.'

The Land Terrapins, except to the scientific eye, are scarcely distinguishable from the true tortoises, but their feet display two marked differences. The toes are furnished with small webs, denoting aquatic leanings at least ; and in some cases the head is simply clothed with a continuous skin.

Though the foregoing animals belong to the terrestrial group, some of them are more or less fond of water ; but the Pond Tortoises are distinctly aquatic, for which they are fitted by their depressed and shelving shell, generally webbed feet, and modified breathing organs. There are only two species, one European and one American. The European Pond Tortoise (*Emys orbicularis*) is common

in the south of Europe, inhabiting fresh water, stagnant and running, and existing on a mixed diet, chiefly water-insects, worms, frogs, fish, crustaceans, etc. It is an excellent swimmer and diver ; but when it basks in the sun on the banks, or leaves the water for any other cause, it is far more active than the terrestrial species. It seeks its food chiefly at night. With the coming of winter it retreats to an underground chamber of its own construction, and remains there until spring.

Passing by the family of Mud Terrapins (*Cinosternum*), whose name signifies their preference for swamps and marshes, we may note the Big-headed Tortoise (*Platysternum megacephalum*) of Burma, Siam, and the south of China, which belongs to the family Platysternidæ. It is a strange-looking reptile, the very flattened carapace and plastron exhibiting the full length of the legs with the toes slightly webbed, but well clawed. The body is only six inches long ; the head, terminating in a hooked beak, is so disproportionately large that it cannot be drawn within the shelter of the shell, and the six-inch tail is at a similar disadvantage.

FAMILY: CHELYDRIDÆ THE SNAPPING TURTLES

The Snapping Turtles, or Alligator Terrapins, have big heads, hooked beaks, and long tails. The head, which is but partially protected by bony covering, is too large for the whole of it to be



SNAPPING TURTLE

withdrawn under the carapace. The Snapping Turtle (*Chelydra serpentina*) is a giant river tortoise, and has a general resemblance to a small alligator enclosed in a tortoise-shell. The carapace is

often quite twenty inches long, and the total length of the reptile is three feet. No better name than 'Snapper' could be applied to it. Projecting from the tip of the tongue are two worm-like threads, which the Snapper exhibits while concealing its body in the mud. Any fish that is attracted by the decoy is instantly caught. The carapace, too, is often covered with vegetable algæ, and various kinds of prey approach it under the impression that it is some inanimate object, only to find out the mistake when it is too late. Bathers frequently receive severe bites, and ducks and geese are seized with avidity. The young Snapper is a table delicacy, and is caught by means of a baited hook; but when an adult, whose musky flesh is not in favour, gets on the line, the angler's tackle is severely tested.

FAMILY: CHELONIDÆ

THE TRUE TURTLES

The true Turtles are marine creatures, having their shells covered with horny plates, but in many respects differing markedly from those Chelonians that are more or less adapted for walking on land. Instead of legs the Turtle has flattened, paddle-like limbs, in which not more than two toes are clawed; the carapace and plastron are never united by bone, and some portions of their edges do not coincide, even when a good age is attained. The head is so poised upon the neck, that the valved nostrils can be raised easily above the surface of the water for breathing. The eggs of the Turtle are soft, whereas those of the land tortoises and terrapins are hard-shelled. These reptiles inhabit the seas of the warmer temperate and torrid zones; they are often encountered hundreds of miles from land, chiefly frequenting the shore only to lay their eggs. Their food is mostly of a vegetable nature, although some of them eat molluscs and other marine creatures. Several species are particularly excellent for food, while others supply the beautiful translucent substance known by the name of 'tortoise-shell.'

Of all the family the most celebrated is the Green Turtle (*Chelone mydas*), which inhabits the Atlantic, Indian, and Pacific Oceans, though not in such numbers as formerly. Exceptionally large specimens weigh more than three hundredweights. The flesh is remarkably rich and well-flavoured, and the green fat has long enjoyed a world-wide reputation. As these creatures are large and very powerful, it is not an easy task to secure them. The usual plan is to intercept them as they are traversing the sands, and to turn them over on their backs. Many of the tortoise tribe can recover their position when thus overturned, but the Green Turtle is quite unable to restore itself to its proper attitude, and lies sprawling helplessly until it is lifted into a boat. In many cases a captive is so heavy that levers have to be employed to tilt it over.

The flesh of the Hawksbill Turtle (*C. imbricata*) is ill-tasted,

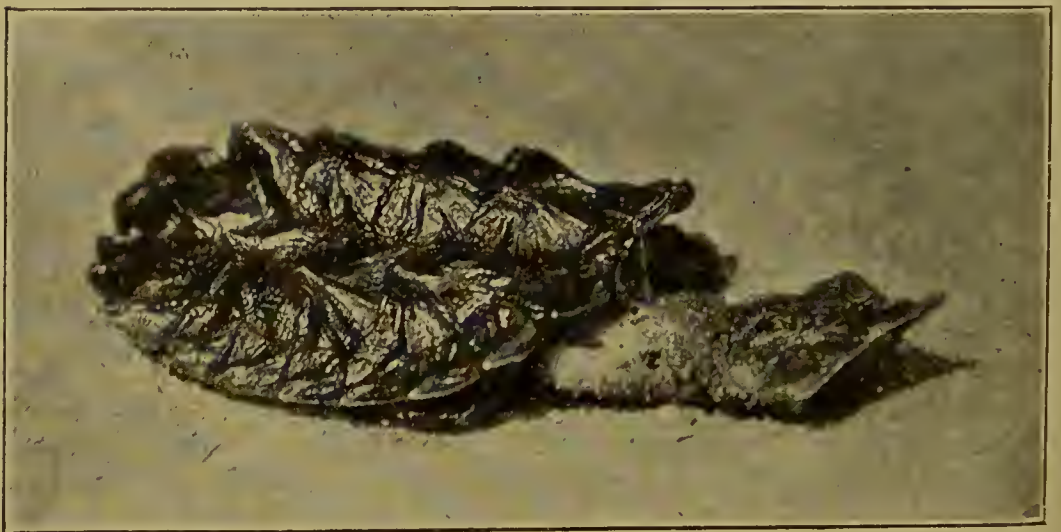
although its eggs are as agreeable in flavour as those of the green species. It is from the horny shields of this Turtle that the 'tortoise-shell' of commerce is obtained. In some regions the shields are removed in a very barbarous manner. The living reptile is held over a fire until the plates part from the bony shell, after which the poor creature is permitted to return to the sea in the belief that the plates will be renewed, whereas the Turtle dies a lingering death. The more humane method is first to kill the reptile, and then remove the plates by means of boiling water. The substance is very workable, and the thin shields can be welded together by being heated in oil, and even the shavings can be moulded into any required shape. Combs, handles, boxes, etc., are a few of the articles into which the tortoise-shell can be fashioned.

The Green Turtle generally lays from one hundred and fifty to two hundred eggs, but the Leathery Turtle (*Dermochelys coriacea*), a member of another family, and the largest of all the Chelonians, lays two batches, numbering quite three hundred and fifty. The eggs are preyed upon by numerous enemies apart from man, and even when successfully hatched the young Turtles become the victims of predaceous animals and birds on land, and voracious fishes in the water ; and, consequently, even this last-named prolific species is ever diminishing in numbers.

FAMILY: CHELYIDÆ

THE SIDE-NECKED TORTOISES

These fresh-water creatures differ from all the preceding species in various respects, but in none more than the neck, which is withdrawn under the shelter of the carapace by a sideways, instead of a backward movement. Some members of the family are called Snake-necked Tortoises. The Matamata Tortoise (*Chelys fimbriata*),



MATAMATA TORTOISE

three feet in length, is a native of Brazil and Guiana. It is as grotesque in appearance as it is ungainly in movement. On the top of its head are two membranous prolongations of the skin, much resembling ears, and from the neck and throat hang various other fringed membranes, all of which are in constant motion to attract fishes near enough to be seized ; but always the long neck is ready to be thrust out to grasp other reptiles, water-fowl, etc. Similar species are found in New Guinea and Australia.

ORDER : SQUAMATA

SUB-ORDER : LACERTILIA

THE LIZARDS

There are quite 1750 species of Lizards comprised in this sub-order. Being of infinite variety in size, shape, and structure, only a few general characteristics can be specified, leaving many features to be gleaned from a consideration of a few typical representatives.

Externally the Lizard generally resembles a diminutive crocodile, so far as the head, neck, body, and tail are concerned ; but there are some species that have no visible traces of limbs, and the uninitiated would probably class them as snakes. Usually the flexible body is covered with overlapping scales, but in this respect there are many modifications. There is no part of the globe, except the polar and sub-polar regions, where Lizards are not found, whether the region be fruitful, swampy, or arid ; but it is in the tropics that they are most abundant, and where they are largest in size, most brilliant in coloration, and most bizarre in shape.

The great majority of the Lizards are land dwellers, preferring dry situations, often among rocks or beneath stones, secreting themselves in any available cleft or chink ; some are arboreal in habit, and possess a prehensile tail to assist them in maintaining a hold on the branches ; some are able to run up vertical surfaces, or walk in an inverted position on the under surface of a branch or other projection ; some take flying leaps by the aid of a parachute-like membrane ; and only a few species are thoroughly aquatic, although many can swim well if necessity call for it.

Not a few Lizards are graceful in form and beautiful in colour ; but many of them possess sundry odd features that make them general objects of distrust, although they are perfectly innoxious. In fact, only the members of one family are poisonous, but there are many that can bite sharply. For food the smaller species rely mainly upon insects, worms, molluscs, etc. ; but the larger kinds add to this diet small mammals, birds and their eggs, and fish. In the colder regions Lizards hibernate for the greater portion of the year, and in the tropics the hottest seasons are passed in a state of torpor.

Many further interesting particulars might be afforded, but none

more remarkable than the ability of many species to part with their tails at will. If an enemy grasp this organ—and often it is held out as a direct challenge—it breaks off. If the captor intended to make a meal of the reptile, for the moment it is perhaps satisfied with a preliminary portion of its prey, but by the time it is ready for the remainder, the now tailless Lizard has effected its escape. The amputation causes only temporary inconvenience, for a new tail is quickly developed, although it is always less perfect than the original member.

The whole Sub-order Lacertilia is divided into two groups, the Geckos and the Lizards proper.

FAMILY : GECKONIDÆ

THE GECKOS

These reptiles, of which there are about three hundred species, are found in almost all parts of the world, but especially in India, the Malay countries, and Australia. They take their name from their cry 'Geck-ko,' the last syllable being given sharply. The plump body is rather flattened; the tapering and brittle tail is usually cylindrical, but in some species is trowel-shaped. The feet are characteristically peculiar. The toes are generally lobated and in some cases terminate in sucker-like discs, by means of which the creature can run up a smooth wall or pane of glass, and can traverse a ceiling with the facility of a fly. The majority of the family are dust-coloured; unlike most lizards they have no movable eyelids; and in habit they are largely nocturnal.

Among the best known is the Common, or Wall, Gecko (*Tarentola mauritanica*), a native of the Mediterranean countries, and extending to West Africa. It is greyish brown in colour and attains a length of ten inches. The Turkish Gecko (*Hemidactylus turcicus*) inhabits very much the same regions, but ranges eastwards towards the Red Sea. It is shorter than the preceding lizard by a couple of inches. The Fringed Gecko (*Ptychozoon homalocephalum*) of the Malay regions is eight inches in length. Extending along each side of its body and also on the limbs and tail are membranous expansions of skin, which enable it to take flying leaps.

The Geckos quite undeservedly bear an evil reputation in various regions. So great is the dread inspired by the Fan-footed Gecko (*Ptyodactylus lobatus*) of Northern Africa, Arabia, and Syria, that it is termed the "father of leprosy." From the earliest times it was supposed to exude poison from its toes, and to be capable of making an impression on steel with its teeth, whereas its jaws are rather feeble, its teeth small, and not capable of piercing anything much harder than the human skin.

FAMILY: LACERTIDÆ

THE TRUE LIZARDS

In this group are various slender, active, bright-eyed little reptiles, often adorned with brilliant colours, and with no repulsive features about them. They all belong to the Old World, and two of the best known occur in England.

The Common Lizard (*Lacerta vivipara*) is about six inches long. It is extremely variable in colour, but most frequently the upper parts are olive-brown with a broken line of darker brown along the back. Upon each side runs a broader band, and between the line and the side bands are black spots and splashes. The underparts are orange, spotted with black or grey. This pretty little reptile is plentiful upon banks, heaths, and commons. It darts about in a lively manner, flitting among the grass stalks with a series of sharp, twisting springs, snapping up flies from the grass blades. In the production of its young the Common Lizard departs from the usual rule of its kind, for the young reptiles, sometimes to the number of a dozen, break out of the eggs while they still remain in the female's body.

The Sand Lizard (*L. agilis*) is sometimes ten inches in length, and as with many other species, the colour varies considerably.

Generally it is sandy brown above, with some faint bands of a darker brown and rows of black spots, which sometimes have a whitish dot in their centre. The sides are tinged with green, and the under surface is white. In some individuals the green shade is more marked than in others, not infrequently leading persons to think that they have alighted upon the Green Lizard (*L. viridis*), which is not



SAND LIZARD

found nearer to England than Jersey. It is chiefly a native of the Mediterranean regions; it is olive-green, spotted with black on the upper parts, and yellow below, and there is a patch of blue on the chin and throat. These two species lay their eggs, cover them up, and leave them to be hatched by the heat of the sun

They may never see their progeny ; but the young of the Common Lizard remain with their parents for some time.

FAMILY : AGAMIDÆ
THE AGAMOID LIZARDS

These Lizards are Old World creatures that live chiefly in southern and eastern regions. Omitting numerous technical details, the few common features may be observed. They differ considerably in shape, according to whether the reptile is terrestrial or arboreal ; in the former case the body is depressed, and in the latter it is compressed. Usually the tail is not brittle, and the eyelids are movable.



MOLOCH LIZARD

‘ Flying Dragon ’ appears to indicate a rather awesome reptile, but the name is often applied to a score of allied species that can be handled with impunity. All of them possess the usual flying membranes, together with inflatable air sacs depending from the throat, and the tail is long and thin. The skin of the Malay Flying Dragon (*Draco volans*) presents variable metallic hues ; the flying membrane is orange in tint with marblings of black ; the air sacs of the male are orange, those of the female are bluish ; and there are other markings that make the creature look like a brilliantly coloured leaf as it sails through the air.

There are many Tree Lizards, but the largest and best known is the Variable Lizard (*Calotes versicolor*), widely distributed between Persia and China. It is sixteen inches in length, and possesses the power of changing its colour in a marked degree. When basking in the sun the prevailing colours are red on the body, yellow dashed with red on the head and neck, and black on the limbs and tail,

a combination of brilliant tints that make this lizard one of the handsomest of the Lacertilia.

The Moloch Lizard (*Moloch horridus*) of Australia, if it were of large dimensions, would be one of the most terrible-looking creatures on the face of the globe. It is all spikes and thorns, two of the largest projecting from each eyebrow, while even the legs, as far as the long sharp claws, are covered with boldly-keeled scales. Nevertheless, the Moloch is perfectly harmless, except to ants and other insects upon which it feeds. In colour it is yellowish, with brown or chestnut markings; but it can change to reddish grey or brown to conform with varying surroundings.

The Frilled Lizard (*Chlamydosaurus kingi*), another native of Australia, attains a length of over thirty inches, of which at least one-third is tail. The upper parts are mostly a shade of brown, often with a tinge of yellow or green; the under parts are stone colour. This lizard's distinguishing feature is its frill, ten to twelve inches across, and having much the appearance of a leaf, faded in the centre but green along its edges. The membranous adornment can be opened or closed umbrella fashion. The Frilled Lizard often walks on its hind legs. When the frill is expanded, and the creature shows only a well-armed mouth in front of it, the rest of its body being concealed, it looks far more formidable than its actions can confirm.

FAMILY: IGUANIDÆ

THE IGUANOID LIZARDS

Except for a few representatives in Madagascar and Fiji, all the true Iguanas inhabit the New World, although various large lizards in the Eastern Hemisphere are often mistakenly called by that name. The ordinary teeth of the Iguanas differ considerably from those of the preceding families, but a particular feature is the possession of teeth on the palate.

The Basilisk was once the centre of some astounding fables. It was said to derive its existence from an egg laid by a cock when he was very old, and hatched in due course by a snake. "Its poison," says an old writer, "infecteth the air, and so killeth all living things; it burneth up the grass whereon it goeth or creepeth, and the fowls of the air fall down dead when they come near his den or lodging." The only creature that could stand in the presence of the Basilisk and live, was reputed to be the cock, before whose shrill clarion the reptile would fly and conceal itself in the desert. If a horseman speared the creature he "did not only draw the poison of it into his own body and so died, but also killed his horse thereby." The reptile, however, has outlived this terrible character. Even the Helmeted Basilisk (*Basiliscus americanus*), two and a half feet in length, with fin-like erections along its back and a great part of its tail, is more harmless than many of the smaller lizards. It is

arboreal, and chiefly vegetarian in habit, spending most of its time on branches overhanging water, into which it plunges when alarmed, being an expert swimmer.

The Sea Iguana (*Amblyrhynchus cristatus*) of the Galapagos Islands was described by Darwin as "a hideous-looking creature, of a dirty black colour, stupid and sluggish in its movements. The usual length of a full-grown one is about a yard, but there are some over four feet long, and weighing twenty pounds. Their limbs and strong claws are admirably adapted for crawling over the rugged masses of lava, which everywhere form the coast." The Sea Iguana is harmless in character, notwithstanding its appearance; it feeds chiefly on seaweed; and though it is the only really marine lizard, it spends no more time in the water than it can help.

The Common Iguana (*Iguana tuberculata*) will serve as an excellent example of various somewhat similar species, and the photograph will render detailed description of its external features unnecessary. A large specimen will measure a yard and a half in



IGUANA ·

length, and will scale thirty pounds. The usual colour is principally dark olive-green, but it is rather variable, even in the same reptile, being affected by change of weather, locality, or temper. This lizard lives almost wholly among the branches, to which it clings with its powerful feet, and on which it finds most of its food. It is almost always to be found on the trees in the vicinity of water, and Napier

Bell says that a traveller, navigating some of the river creeks in South America, "often encounters quite a shower of falling Iguanas and runs some risk of getting his neck broken." The flesh of this long-tailed, dew-lapped, spiny lizard is accounted tender, and of a peculiarly delicate flavour, not unlike the breast of a spring chicken.

FAMILY: ANGUIDÆ

THE SNAKE-LIKE LIZARDS

There are only a few species comprised in this family, and the best known is the common English Blind-Worm (*Anguis fragilis*). It is spread over the greater portion of Europe, Western Asia, and parts of Northern Africa. In our country it frequents hedgerows, heaths, forest lands, etc., where it can find its usual food—slugs, worms, and insects. In this lizard there is no external trace of limbs, and its body is more uniformly smooth than in some of the snakes; its teeth approach the serpent type, and it changes its skin in a single piece, like a snake, instead of in fragments as is the common lizard fashion. But the Blind-Worm possesses the typical lizard tongue, which is never furnished with a sheath, and it has external ears and eyelids, which are not found in the snake. The Blind-Worm varies in length from ten to fourteen inches; in colour it is chiefly brownish bronze. Notwithstanding its name, it has a pair of brightly shining eyes, as have most creatures that prey upon insects. The young are born alive, the eggs being hatched while contained in the body of the female, which basks much in the sun, so that its heat may assist the operation of incubation.

The Amphisbænas belong to an entirely different family. They are all worm-like in body, and possess the power of moving backwards or forwards with equal facility. In all the species, except one, there is no outward sign of limbs; but the Handed Amphisbæna (*Chirotes caniculatus*), quite close to its head, has two small forelimbs, each furnished with four toed claws. It is about seven inches in length; it is brownish in colour, and it lives chiefly upon ants.

FAMILY: HELODERMATIDÆ

THE POISONOUS LIZARDS

Although the Lizards form so large an assemblage of creatures, many of them strange and forbidding enough in aspect to cause feelings of violent repulsion, only two species are poisonous, and both are of the same genus. The Gila Monster (*Heloderma suspectum*) of Mexico is a plump reptile about a foot and a half in length. In colour it presents a kind of mosaic design in orange and black on the body, and rings on the tail. Set loosely in the jaws are recurved ang-like teeth, which are grooved for the transmission of the

poisonous fluid. The Gila Monster frequents sand and pebbles, where its coloration renders it difficult to be perceived. It is lethargic during the day, but at night crawls about in search of worms, frogs, etc. Its poisonous bite paralyses a frog, and though it will not cause death to human beings, the effects are unpleasantly severe. The Arizona Heloderm, an allied species, is so similar as to call for no description.

FAMILY : VARANIDÆ

THE MONITORS

The Monitors, the largest of the Lacertilia, are the lizards that are so often confounded with the iguanas, from which they differ considerably in various respects. The body is depressed and not compressed, and the colour is generally black, brown, olive and yellow in varying proportions. They frequent bushes, grass, and crops rather than trees. The largest species is the Water Monitor (*Varanus salvator*), which ranges from India to Australia. It attains a length of about seven feet, and is equally at home on land, in water, or among the branches of trees. It is carnivorous in diet, preying on frogs, snakes, small mammals, and birds; it eats the eggs of both birds and reptiles, with a special leaning towards those of the crocodile, whose newly hatched young it also chases and devours. It is not surprising that the natives of some regions believe that the Monitor develops into a crocodile in the process of time.

SUB-ORDER : RHIPTOGLOSSA

FAMILY : CHAMÆLEONTIDÆ

THE CHAMÆLEONS

Avoiding technical distinctions, these creatures differ from all of the preceding Lizards in two important respects: the tongue is club-shaped, very protrusile and viscous at its extremity, and in the foot two of the toes are opposed to the other three, reminding one of the zygodactylous foot of the climbing birds. The long tail is prehensile, but it is neither brittle nor renewable. The eyes of these strange reptiles are worked quite independently of each other; one will roll backwards while the other is directed forwards. There may be no more expression in the eye than in a green pea with a dot of ink upon it, as the Rev. J. G. Wood picturesquely described it; but there is no defect in its vision, and when it has focussed a fly, the insect is doomed. The sticky tongue shoots out like lightning to a distance of from four to six inches from the mouth, and alights unerringly on its prey; but like many other reptiles the Chamæleon can live for months without taking any food at all.

Most of the lizards are constitutionally torpid, but the Chamæleon is sluggishness itself. When it moves along the branch to which it clings, it raises its feet very slowly; sometimes it will keep a foot in

the air for some time, and between the deliberate steps it coils its tail round the branch, as if to make sure of its safety while taking rests between times. Running is a feat to which the Chamæleon never aspires. Most of the fifty species lay eggs, and only a few produce living young.

The largest Chamæleon (*Chamæleon parsoni*), a native of Madagascar, attains a length of two feet ; the Dwarf Chamæleon (*Brookesia nanus*) exceeds scarcely more than as many inches. Various species are found in Arabia, India, and Ceylon, but the Common Chamæleon (*C. vulgaris*) inhabits the African and Asiatic coast regions of the Mediterranean Sea, and Andalusia.



CHAMÆLEON

These most singular reptiles have long been famous for their power of changing colour, an accomplishment that has been exaggerated more than a little, for in reality there are various lizards that possess greater powers of changing their tints, notably the Variable Lizard. Most of the Chamæleons are of a greenish hue during the day, changing to whitish yellow at night ; but to a great extent " any one of these reptiles assumes the colour of the surface on which it is placed, greyish, reddish, green, or yellow, as may be." The Rev. J. G. Wood once kept a Chamæleon for a long time, and carefully watched its changes of colour. Sometimes it would be striped like a zebra with light yellow, or covered with circular yellow spots ; often it was a brilliant green ; sometimes it would be grey, covered with black spots ; and once, when it was sitting on a branch, it took the hue of the autumnal leaves so exactly that it could scarcely be distinguished from them.

SUB-ORDER : OPHIDIA

THE SNAKES

The Snakes are excellent types of the Reptiles, since they are real 'creepers,' and thus strictly conform to the name of their class. The vast majority of them are without any vestige of limbs, and only the pythons and boas have a pair of little horny spurs near the base of the tail, supported by tiny bones that are the undeveloped commencements of hinder limbs. It may be noted that to this extent these Snakes are really better limbed than is the common blind-worm, which, though limbless, is a lizard.

The vertebral column of the Snake is a wonderful example of animal mechanics, and is constructed specially to permit the peculiar method of creeping progression to which the reptile is restricted. Each vertebra is rather elongated, and is furnished at one end with a ball and at the other with a corresponding socket, into which the ball head of the succeeding vertebra exactly fits. In some species there are no less than four hundred vertebræ, and to each of these, except a few near the tail, is connected a pair of slender curved ribs, to which, in turn, the socket principle also extends. With these provisions for the highest degree of flexibility, it is possible for a Snake to writhe and twine in all directions without danger of dislocating its spine.

A Snake really walks upon its ribs, which are moved forward one pair at a time, motion being aided by the large cross scales that cover the lower surface. Where each scale overlaps its successor, the free edges form a bold, horny ridge which, as the ribs go forward, hitches on to any roughness or inequality in the ground and is used as a lever in thrusting the body forwards, repeating the operation with successive ribs and scales, thus attaining the quiet and gliding movement that is characteristic of the serpent tribe.

In common with other reptiles the Snake has its body covered with a delicate epidermis, which lies over the scales, and is renewed at tolerably regular intervals. This transparent skin splits near the back of the head, and the Snake wriggles out of the old integument, which is impressed with the shape of each scale, and even the transparent shields, which cover the lidless and immovable eyes like watch-glasses. The skin is shed because it becomes so hard and tough that breathing and growth would be checked, and the reptile would die. To remove its old coat a Snake often drags itself between two stones, or a forked branch, and it quite depends upon circumstances whether the slough is entire or in pieces.

The tongue of the snake is long, black, and deeply forked at its extremity, and even in a poisonous reptile this organ is perfectly harmless, and not a 'sting' in any sense. When not in use it is always withdrawn into a sheath. The teeth are always numerous,



PLATE XXI
Heloderm
Diamond Rattle-snake
Royal Python



and in addition to those which border the upper and lower jaws, some species have an inner row affixed to the bones of the palate. This form of dentition is well shown in the photograph of the bones of the skull of an Indian python. The teeth all point backwards ; they cannot be used for tearing food to pieces, and thus the Snake swallows its prey whole. In the poisonous Snakes the upper jaw is often devoid of teeth, except two long poison-bearing fangs, set one at each side, and near to the muzzle. These fangs are either tubular, or grooved, for the conveyance of the fluid from the poison glands, which are furnished with muscles for discharging the venom into the wound.



SKULL OF AN INDIAN PYTHON

The bones of the jaws are very loosely connected, their different portions being quite separable, and giving way when the wonderful powers of swallowing are exerted. Some of the larger Snakes can engulf animals of great proportionate size, the mouth widening until the whole jaw becomes dislocated, and the bones are only held together by the elastic ligaments, which in due course contract and draw the bones into their proper places. Some Snakes eat their prey alive, but others first kill their victims, either by poison or by crushing them to death.

Concerning the production of their young, there is considerable variation. Most of the members of the sub-order lay leathery-shelled eggs, leaving them to be hatched by the natural heat of the

spot where they are deposited ; others retain the eggs within their bodies until the young break out of them ; and a few species actually incubate their eggs by coiling the body around them.

The Ophidia are divided into various families and sub-families, but on the whole their points of difference are of too technical a nature to be set forth in detail. Some of the families must necessarily be omitted, leaving the main types to represent the members of a very large sub-order.

FAMILY: COLUBRIDÆ THE COLUBRINE SNAKES

This large and comprehensive family includes quite nine-tenths of the whole species in the Ophidia, and they may be described non-technically as those snakes which do not come under the headings of pythons and boas. They have not the slightest vestige of limbs, their eyes are well developed, and their upper jaws carry numerous teeth, but only in normal style. The harmless snakes possess solid teeth, but the venomous ones are furnished with grooved or tubular fangs. Of the three species of snake found in the British Isles, two of them are members of this family and claim first attention.

The Ringed Snake, or Grass Snake (*Tropidonotus natrix*), is common in most parts of Europe ; in England it favours the southern counties more than the northern ; it is almost unknown in Scotland, and no snakes of any kind make their home in Ireland. Average reptiles of this species are from two and a half feet to three feet in length, but exceptionally large ones have measured nearly six feet. It is often difficult to describe the colours of a bird's plumage ; easier with the majority of the lizards ; but many of the snakes not only show numerous colours and shadings, but they are so varied as to produce well-marked and often perfect geometrical designs and mosaics of the most intricate description. The Ringed Snake is generally greyish green above and blue-black below ; behind the head is a broken collar of golden yellow in front of another imperfect collar of black ; and along the back run two rows of small dark spots, while oblong spots are arranged along each side.

This reptile frequents hedgerows, copses, and woods, where it preys chiefly on frogs, mice, voles, young birds, insects, etc. ; it is very fond of water, is an excellent swimmer, and adds fish to its general diet. During winter the snake retires to a sheltered spot, often in a hole in a bank, or under the gnarled roots of a tree, under dry brushwood, etc. Frequently a hundred reptiles will be found in one hollow.

In September, 1900, various newspaper paragraphs suggested that the descriptive reporter was allowing his fertile imagination to run riot. It was stated that a house at Cefncaeuan, near Llanelly,

was suffering from a plague of snakes ; the reptiles were of all sizes ; they crawled over floors, infested cupboards, curled themselves up on chairs, and in the bedrooms took their ease between blankets and sheets.

Investigation naturally followed upon the discovery of what appeared to be unique in the history of British snakes. At the back of the house was a wall overlooking a wet ditch, and three hundred yards distant was an old stone quarry. In a hole in the wall were



RINGED SNAKES EMERGING FROM EGGS

discovered 1200 Ringed Snake eggs, just on the point of hatching. It was eventually proved beyond all doubt that the snakes came from the quarry, for only in the previous year some workmen had there destroyed an immense number of reptiles, many of them four feet long, which were hibernating in clusters.

The Ringed Snake is often called the Common Snake, Water Snake, Green Snake, and Hedge Snake.

The Smooth Snake (*Coronella austriaca*), though common on the Continent, is of rather rare occurrence in this country, and practically is restricted to the sandy heaths of Dorset and Hampshire. It is about two feet in length. In colour it is rusty brown on the upper parts, with two rows of irregular dark spots on the back ; the under parts are often steely blue or reddish yellow, sometimes spotted with black. The food of the Smooth Snake consists chiefly of mice, lizards, etc. It hunts its prey fiercely, but its bite causes no ill effects to human beings. The creature is viviparous, and brings its young ones alive into the world, usually a dozen at a birth.

The Egg-Eating Snake (*Dasypeltis scabra*) is a native of South Africa ; it attains a length of two feet and a half, and does not much exceed a man's finger in thickness. It feeds chiefly on the eggs of small birds, but if it gain access to a hen-roost it will contrive

to swallow a hen's egg, although in the effort the reptile's head is so swollen that the mouth cannot be closed. The actual swallowing, however, is less curious than the fact that the egg remains entire until it reaches the throat, where a row of bony processes splits the shell longitudinally and releases its contents, thus preventing the possibility of the slightest waste. Presently the shell and its inner lining are ejected from the snake's mouth.

There are Water Snakes, Tree Snakes, Climbing Snakes, and Nocturnal Snakes, all of which have some leading habit signified in their name; and much might be said of these groups, if space were not required for the Cobras of Southern Asia and Africa.

The Cobra is among the most deadly of the serpent tribe. There are half a dozen species, each possessing the power of expanding the neck, popularly called the hood, the back of which is ornamented with two large eye-like spots, united by a curved black stripe, and so formed that the whole mark bears a singular resemblance to a pair of spectacles.

The Common Cobra (*Naia tripudians*) was named the 'Cobra de capello,' or snake with the hood, by the Portuguese, who first met with it in Ceylon. Its range includes the whole of India and regions eastwards towards the Caspian, and westwards to Southern China. Its length is usually six feet, but fine specimens attain an additional foot. In colour it is remarkably varied; sometimes the body is brownish olive, and the spectacles are white, edged with black; others are grey, or even black, and often show light bands over the body; some have only a single eye spot instead of the spectacles, and others have no mark at all. The under parts may be anything from white to black, frequently with cross bands on the fore parts.

The Cobra appears to be very susceptible to music. It is often shown by Hindu snake-charmers, who handle the fearful reptile with impunity, causing it to move in time to musical sounds. One of these men will allow a snake to twine about his naked breast, tie it around his neck, and treat it with as little ceremony as if it were an earthworm. Doubtless some of these performing snakes have had their poison fangs extracted, but, on the other hand, jugglers and charmers have been known to lose their lives by bites from their reptilian playmates.

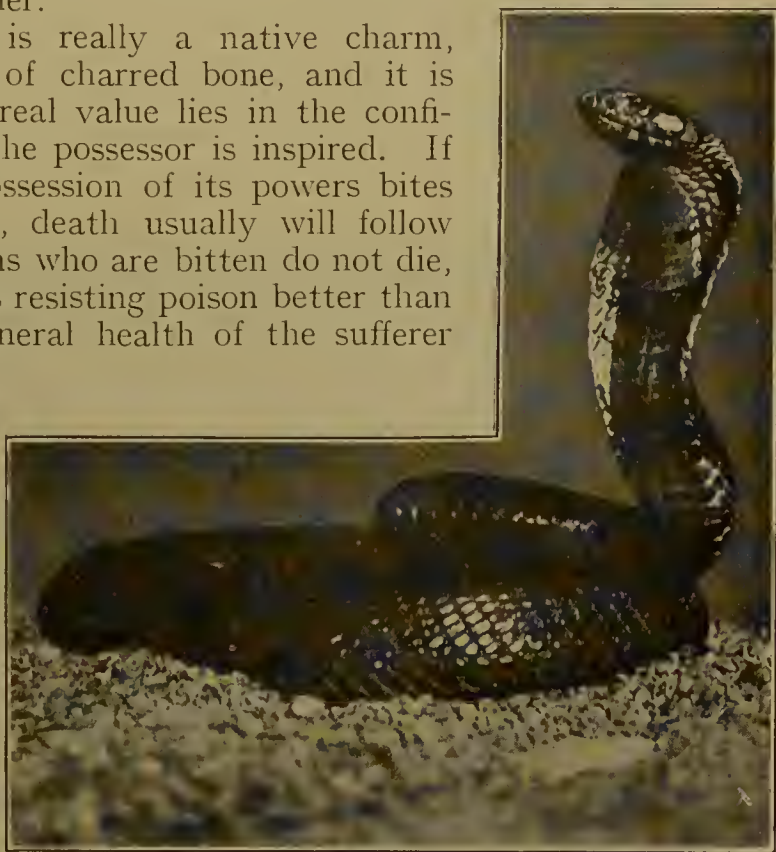
Mr. H. E. Reyne once tested a snake-charmer, who for a rupee consented to catch a Cobra that was known to occupy an ant-hill in the jungle. "When we arrived at the spot, he played upon a small pipe, and after persevering for some time, out came a large Cobra. On seeing the man it tried to escape, but he caught it by the tail and kept swinging it round until we reached the bungalow. He then made it dance, but before long it bit him above the knee. He immediately bandaged the leg above the bite, and applied a snake-stone to the wound to extract the poison. He was in great pain for

a few minutes, but after that it gradually went away, the stone falling off just before he was relieved. When he recovered, he held up a cloth, at which the snake flew, and caught its fangs in it. While in that position, the man passed his hand up its back, and, having seized it by the throat, he extracted the fangs in my presence and gave them to me. He then squeezed out the poison on to a leaf. It was a clear, oily substance, and when rubbed on the hand produced a fine lather."

A snake-stone is really a native charm, usually consisting of charred bone, and it is supposed that its real value lies in the confidence with which the possessor is inspired. If a Cobra in full possession of its powers bites and injects poison, death usually will follow rapidly. All persons who are bitten do not die, some human beings resisting poison better than others, and the general health of the sufferer is always an important factor. When a bite is not followed by fatal results, more often than not it is because the Cobra's poison glands are exhausted from recent use, thus lessening its power to inflict a deadly wound.

The virulence of Cobra poison was once exemplified by the experience of the late Mr. Francis T. Buckland. The naturalist was skinning a rat which had been struck by a Cobra, forgetting that in cleaning one of his nails with a penknife he had separated the nail from the quick. Into the slight crack a minute dose of poison penetrated, and though the venom was not received direct, but only after it had been diffused through the system of the rat, he suffered excruciating pains, and his life was all but sacrificed.

The Death Adder (*Pseudechis porphyriaca*) of Australia is one of various species whose name alone is terribly suggestive of their venomous capabilities. Seven feet in length, this reptile is generally purplish black on the back, with much red on the under parts and carmine on the sides.



BLACK AND WHITE COBRA

FAMILY : VIPERIDÆ

THE VIPERS

This family claims the evil distinction of comprising only poisonous snakes, most of which have a thickened body, a flattened and often triangular head, while the tail is stumpy, instead of being long and sharply pointed.

The British Viper (*Vipera berus*) is a common European species that is found almost everywhere between the Arctic Circle and Spain, and across all Northern Asia to the Pacific. Its length in Great Britain varies from twenty to twenty-five inches, although on the Continent it is often slightly longer. It brings forth its young



BRITISH VIPER

alive, seldom less than ten, and often half as many again. The colour of the Viper is rather variable, but the series of zigzag blackish markings down the back is an unfailing sign of the species, and little triangular spots are found along the sides. The zigzag lines usually end in a V-shaped patch of brown or black on the crown of the head, and by this mark alone the Viper, or Adder, as it is commonly called, may be distinguished from the non-poisonous British snakes. Like most reptiles, whether poisonous or not, the Viper is a very timid creature, always preferring to glide away from a foe, rather than to attack, and only biting when driven to do so under great provocation. Its ordinary food is much the same as that of the common snake, except that it is less partial to frogs, and prefers the smaller mammalia to any other prey.

The consequences of a Viper bite vary considerably in adults, but the chief symptoms, apart from the pain of the wound, are sickness, prostration, and loss of consciousness, and where death occurs it is the result of heart failure. Simply expressed, the sufferer exhibits all the signs of severe local blood poisoning, and even when the patient recovers, the effects are felt for some weeks afterwards.

Frequently the statement is made that snakes swallow their young ones to provide temporary shelter from danger. Many persons declare, with a wealth of realistic detail, that they have witnessed such feats on the part of the British Viper. But scientists maintain that such a performance is an anatomical impossibility, and there the question remains awaiting convincing solution, either one way or the other.

The Puff Adder (*V. arietans*) is distributed over nearly all Africa. It attains a length of six feet, with a circumference as great as a man's arm. In colour it is brown, chequered with darker brown



PUFF ADDER

and white ; there is a reddish band between the eyes ; the under parts are paler than the upper. Its large, flattened head is one of the most repulsive things in nature ; and the malignant, stony stare of its eyes as it rises from where it is half hidden in the sand, freezes one with horror. When approached, it never attempts to escape, and if angry or alarmed it swells its body visibly by drawing in a full breath, and then expelling the air gradually with a sighing sound. Its whole appearance is decidedly indicative of venom, and the reptile is, indeed, one of the deadliest of the whole

tribe. A horse bitten by the creature will die in the course of a few hours. The Bushmen of South Africa formerly tipped their arrows with the poisonous fangs of the Puff Adder, which are well displayed in the photograph.

The Common Rattle-Snake (*Crotalus horridus*) of North America is another particularly deadly reptile, varying from four and a half feet to six feet in length. It derives its name from a number of curious loose, horny structures, which form the extremity of its tail. Fortunately for the human inhabitants of the same regions, it is slow and torpid in its movements. When about to inflict the fatal blow, the reptile seems to swell with anger, its throat dilating, and its whole body rising and sinking as if inflated by bellows. The tail is agitated with increasing vehemence, the rattle sounds its threatening war-note, and as the head is drawn back ready for the stroke, the whole creature seems a very incarnation of deadly rage.

The bite of the Rattle-Snake has been known to cause death in two minutes, and if the end is delayed, it is but a prolongation of intensest suffering. The terrible symptoms have been described thus: "A sharp pain in the part, which becomes swollen, shining, hot, red; then livid, cold, and insensible. The pain and inflammation spread, and become more intense; and a burning fire pervades the whole body. Then come swoonings, cold sweats, and sharp pains in the loins; the skin becomes deadly pale or deep yellow, while a black, watery blood runs from the wound. Violent headache succeeds, overwhelming terrors, burning thirst, convulsive hiccoughs—and death."

It was at one time supposed that the rattle was intended as a warning of the reptile's approach, which Darwin asserted was no more likely than that a cat should warn a doomed mouse. He believed that the cobra expands its hood, the puff-adder swells, and the Rattle-Snake rattles on the same principle that a hen ruffles her feathers when a dog or a cat approaches her chickens.

The Diamond Rattle-Snake (*C. adamanteus*) is not only larger, but is the most beautifully marked of the various species, all of which are equally poisonous, and almost identical in habits. In the colder regions Rattle-Snakes congregate in thousands, huddled together for warmth during their winter sleep. This peculiarity well served the earlier settlers in North America, who were enabled the easier to rid districts of snakes by means of annual hunts.

The Bushmaster (*Lachesis muta*), a native of Brazil, Guiana and adjacent regions, is a terrible reptile. It is from nine to twelve feet in length. It is reddish yellow with large dark lozenges on the upper parts, and yellowish white beneath. Fortunately it is not common and confines itself chiefly to the innermost forest regions, where it is the absolute master of man and beast alike. It is nearly as thick as a man's arm, its mouth is unusually large, and the poison fangs may be three inches in length. The reptile not only

will not fly from man, but will pursue him, striking with immense force, and causing a wound as if two or three inch nails had been driven into the flesh. The poison issues from the ends of the fangs, and therefore at once reaches very considerably below the surface ; and if an artery is perforated death is almost instantaneous.

The Fer-de-Lance (*L. lanceolatus*), or Rat-tailed Viper, grows to a length of nearly seven feet. Its home is in Central America and the Antilles, where it is particularly dangerous to workers in the sugar plantations. The Mongoose was imported into these regions in the hope that it would wage successful war against the ferocious reptile. The little warrior, who is a match for the cobra, found itself unable to hold its own with the Fer-de-Lance, and elected to seek out easier prey.

FAMILY : BOIDÆ

THE PYTHONS AND BOAS

In this family are the largest of the snakes. Reference has already been made to the small, claw-like spurs of these reptiles, which are relics of hind limbs, and are particularly interesting to students of evolution. None of the members of the family are poisonous. For food they prefer warm-blooded animals, whose bodies they crush by enfolding them in their coils. Notwithstanding many exaggerated accounts to the contrary, these gigantic snakes cannot swallow the carcasses of the largest mammals, and even a small deer has to be reduced to the condition of a very thick sausage before it can be stowed away. The young are produced from eggs, the female not only protecting them, but also assisting in their incubation by coiling her body around them. The pythons and the boas form separate sub-families, namely, the Pythoninæ and the Boinæ.

The Reticulated Python (*Python reticulatus*) commonly attains a length of over twenty feet ; one magnificent specimen in the British Natural History Museum measures 24 feet 11 inches, and reptiles of 30 feet in length have been recorded. The average Python is from 15 to 20 feet long, with a girth equal to that of a man's thigh, so that only a moderately large one is sufficiently formidable in appearance. This species is a native of the Malayan countries. Generally, its colour is lightish yellow above, diversified with variously shaped dark markings ; there are brown spots on the sides, and the underparts are yellowish. The West African, or Royal, Python (*P. sebæ*) rarely exceeds 23 feet in length, and ranges southwards as far as Natal, where it is known as the Rock-Snake. It is usually pale brown above ; along each side of the back is a dark stripe, sometimes continuous, sometimes broken, and between the stripes are darker and black-edged wavy cross-bars ; black spots mark the sides. There is a dark stripe on each side of the head, and a blotch beneath each eye ; the underparts are

spotted with dark brown. It is really impossible in a few words to describe the gorgeous prismatic tints, especially when the sun plays upon these surface markings.

The Indian Python (*P. molurus*) rivals its Malayan cousin in size. Once a keeper in the reptile house at the Zoo presented a fowl to one of these huge reptiles. The snake was just then shedding its skin, and was nearly blind. It missed its aim, and instead of seizing the bird, grasped the man's left thumb, and instinctively it flung its coils around the keeper's arms and neck, as is customary when the prey seized is of considerable size. The man endeavoured to force the snake's head from its hold, but could not reach it as he was bound in the folds. He cast himself on the ground in order to battle to better advantage, but would probably have succumbed to the fearful pressure, had not two other keepers providentially entered the house, and by breaking the serpent's fangs released the man from his terrible assailant. Except for the fright, and a few wounds from the reptile's teeth, no evil results followed.

These huge snakes kill their prey by compression or strangulation. To crush a tiger, or even an ox, is quite within their capabilities, but no such animals could be reduced to a size small enough to be swallowed. They live entirely on mammals and birds, not troubling to remove either fur or feathers before devouring them, their passage into the digestive organs being aided by a liberal amount of saliva.

The Boas are more arboreal in habit than the pythons. The Common Boa (*Boa constrictor*), which is widely distributed in the warmer regions of South America, seldom exceeds fourteen feet in length. It kills its prey by constriction. Its skin stretches to an almost unbelievable degree, and its whole body is so dilatable that the shape of a large animal is often discernible through the skin for some time after being swallowed. Reports of it killing men and horses have no foundation in fact, the largest of its victims probably being the agouti and paca, and the greater part of its food consists of birds, rats, and mice.

The action of swallowing on the part of any snake is almost absolutely mechanical, and is less a matter of eating, as generally understood, than that the creature draws itself over its prey and gradually envelops it. This point was demonstrated once in the Adelaide Zoological Gardens, where two pythons caught hold of the same rabbit. There came a moment when the noses of the reptiles met, and then, slowly, the larger of the twain commenced to engulf its slightly smaller relative. Probably this was from no personal cannibalistic desire, but merely the mechanical impulse to continue the swallowing process as long as the mouth could feel anything within it. In the London Zoological Gardens, one night in October, 1892, a similar fate befell one of a couple of fine boas. Though no human eye witnessed the accident, it was quite evident that the

larger boa had swallowed its companion, which was nine feet in length. The absorber lay stretched at full length on the floor of the cage, its body distended almost to bursting point, the



COMMON BOA

usually overlapping scales being completely separated. It took nearly a month for the gigantic meal to be digested. The process of deglutition is always slow, especially if the quarry is clothed with long hair or feathers ; and during the time of digestion the snake is very lethargic.

The Anaconda (*Euneces murinus*) of the Guianas and Brazil is the largest of the Ophidia. In the British Museum is a stuffed specimen twenty-nine feet in length, but there is every reason to believe that the creature sometimes attains a length of forty feet. It is equally at home on land or in water, and from the branch of a tree it will dart down to seize a peccary or any other animal that happens to pass within reach ; and human beings are liable to suffer the same miserable fate.

Notwithstanding the repugnance which reptiles excite in the average mind, we have seen that crocodiles and lizards are utilised as food ; but one would think that the line would be drawn at snakes. Some of the Congo natives regard the eggs of the boa as a rare delicacy, and probably an Englishman would prefer them to the putrid eggs of birds which John Chinaman finds exceedingly palatable. Frank Buckland once tasted boa flesh and found it to taste something like veal ; but snakes are largely eaten in China, Japan, Malaysia, West Africa, Brazil, and many other regions ;

anaconda flesh is approved by various poor tribes ; the Red Indian relishes the terrible rattle-snake ; and even the Italians do not disdain a jelly made of stewed vipers.

ORDER : RHYNCHOCEPHALIA

THE BEAKED LIZARDS

This order is represented by only one species, the Tuatera (*Sphenodon punctatus*), which stands apart from all other members of the reptilian world. The skeleton presents many interesting aspects for the consideration of the scientific naturalist, but we must perforce limit ourselves to a few characteristic features. Externally it is decidedly lizard-like, with spiny scales along the back ; the five-toed feet are clawed, and partially webbed ; the tail is brittle and easily shed ; and there are teeth on the palate as well as along the edges of the jaws. It is a remarkable fact that the Tuatera at one time possessed a third eye in the middle of the skull. The organ is now quite useless, and has shrunk to very tiny proportions ; but, nevertheless, it remains, under the opaque skin, an interesting relic of times, how far back no man can tell.

The Tuatera is between one and a half and two feet long ; its colour is chiefly dark olive-green, except for its sides which are spotted with white. It formerly existed in New Zealand, but with the advance of civilisation it decreased in numbers, until it is now found only in a few small islands. It digs a burrow which is often used for nesting purposes by various species of the petrel tribe, the reptiles and birds being on quite sociable terms. The young Tuatera, however, is not hatched within the burrow, sunshine being necessary for the incubation of the eggs, which are generally at least twelve months old before the young break out of them. There is little or no warmth from the sun for some months in each year, and during this period incubation is suspended, so that the living embryo practically hibernates within the egg.

AMPHIBIANS

CLASS : AMPHIBIA

THE AMPHIBIANS

ON account of their peculiar development, which in some respects gives them a strong likeness to the fishes, the frogs and toads and their near kin, the salamanders and newts, have a good claim for reference to a distinct class. The term Batrachians, often used for the group, really refers only to frogs and toads, and the name Amphibians is far more appropriate to the mode of life followed by the whole of the members of the class. The young of the Reptiles, whether they are born alive or hatched from eggs, are in the form from which they will not deviate through life ; but the typical Amphibian passes through a series of metamorphoses, which will be described specifically in the case of the frog. The skin of these creatures is naked and soft, and moisture is absorbed through the pores, instead of drinking in the usual manner ; and there is no expansion and contraction of the chest cavity in breathing, the air being taken simply in gulps. The Amphibians are cold-blooded, and practically all of them require moisture to live in comfort, in most cases not being able to exist without it. In the earlier stages of life they chiefly eat vegetable substances, but all the adult beings are carnivorous. The order is very widely distributed, and some of its members are found wherever water and warmth suit their modes of life ; hence they are most abundant in tropical and sub-tropical regions ; they are absent from the frozen north and south, and are equally unknown in desert regions.

ORDER : ANURA

THE TAILLESS AMPHIBIANS

The Frogs and Toads in an adult state possess four limbs, but are tailless, as designated in another scientific name, the Ecaudata. Notwithstanding the exceeding softness of their bodies, they are true vertebrates. Each has a backbone, ribs, and a cavity containing the brain. The spine consists of not more than eight vertebræ, the remainder being fused together to form one long bony rod. There are about a thousand species of Frogs and Toads, but a very brief consideration of a few prominent types must serve for the whole of them.

FAMILY: RANIDÆ
THE TYPICAL FROGS

The Common English Frog (*Rana temporaria*) is too well known to call for description, and attention may be confined to its habits. The production of the young and the various stages of growth are exceedingly interesting. In the spring the female deposits in water a number of little balls, each about the size of a pea, and marked with a black spot, all connected by mucilage into a jelly-like mass. The eggs are hatched by the heat of the sun. The young Frog, or Tadpole, when it leaves the egg, has no legs; nor does it need any for what at first is to be a strictly aquatic life. It has a long compressed tail, gills instead of lungs, and a fish-like heart; but, unlike the fish, it is devoid of either arm-fins or leg-fins. The gills are visible appendages on either side of the head; but shortly they diminish, and are gradually drawn into the cavity of the chest, guarded externally by a kind of gill cover. Other changes are in progress. Two little projections appear through the skin, and eventually become the hind limbs; then the fore limbs similarly appear, and the tail becomes absorbed into the body, not falling off as is often popularly believed.

The internal changes are equally wonderful. The lungs are developed, the heart receives a third chamber by the expansion of one of the arteries, and the tadpole ceases to be a fish. It becomes an air-breather, and must come to the surface of the water at intervals to replenish its stock of fresh air. It is now a Frog, feeding on worms, slugs, insects, etc., and it is commonly recognised as one of the gardener's best friends.

The celebrated Edible Frog, or Green Frog (*R. esculenta*), of Europe is a handsome species common in East Anglia, the warmer parts of the Continent, a great portion of Asia, as far east as Japan, and some parts of Northern Africa. In colour it is bright green with black spots above, and yellowish beneath. The French were the first to make use of frogs as a table dish, and the taste has spread to the United States; but even the *entente cordiale* has



EDIBLE FROG

failed to tempt the average Englishman to acquire an appetite for the hopping delicacy. Generally only the hinder quarters are eaten, which are skinned and brought to market on skewers. The flesh is white, tender, and as a nutritious and delicately flavoured dish is said to surpass flesh, fowl, or fish.

The Bull Frog (*R. catesbiana*) of the North-Eastern United States, mainly brown or olive marbled with darker shades, is seven inches long, and weighs as much as half a pound. It is abundant in many swampy regions, from which a croaking concert can be heard for a distance of several miles.

The Flying Frogs inhabit the islands of South-Eastern Asia and Madagascar. The Bornean Flying-Frog (*Rhacophorus pardalis*) is chiefly shining green in colour. The body is about four inches in length, and the long toes are so fully webbed that, when expanded, they cover a space of twelve square inches. The extremity of each toe is developed into a disc, as in the case of the gecko. These dilated toes assist the creature to adhere to leaves, etc., while the comparatively huge webs of the feet serve almost like wings in leaping from tree to tree.

MISCELLANEOUS FROGS

Some special feature is connected with each of the following species, which belong to almost as many different families, whose technical names may be omitted.

The Tree Frogs, as implied by their name, spend their time on trees, searching the leaves and boughs for insect food. In winter they retire to water to deposit their spawn and hibernate. The Green Tree-Frog of Europe (*Hyla aborea*) is a really pretty little amphibian. It is green above, sometimes spotted with olive, and a yellow streak runs through each eye towards the sides. Below, it is paler in hue, and a black streak runs along the side, dividing the vivid green of the back from the white hue of the abdomen. The Green Tree-Frog is in the habit of attaching itself to the under side of leaves, seldom being seen on the ground except in the breeding season.

In the Pouched Tree-Frog (*Nototrema marsupiatum*) of Central America, we find a singular example of structure. The female is furnished with a pouch on her back, which is very comparable to the living cradle of the marsupial mammals. When the dozen or more eggs are laid, the male picks them up with his hind feet and places them in the pouch, where the eggs and the tadpoles undergo the whole of their transformation.

Darwin's Frog (*Rhinoderma darwini*) is a native of Chili, and is remarkable for the positively weird fashion in which it produces its young. When the female deposits her eggs, a dozen or so in number, the male swallows them, passing them into a pouch, that is really an enlarged throat-sac. In due course the eggs develop

into tadpoles, which make their first appearance in the world by way of their sire's mouth. These little creatures exemplify the truth that there is no waste in Nature ; and as they do not commence their existence in water, they never possess the external gills of the tadpoles that are born in the typically amphibian manner.

FAMILY : BUFONIDÆ

THE TOADS

The Common Toad (*Bufo vulgaris*) well represents the family, the members of which are distinguished from the Frogs by the absence of teeth ; the legs are shorter and stouter, and the hind feet are only partially webbed, the head is more blunt, the ears are more developed, and the skin is very warty. The eggs of the Toad are not laid in a mass, but in a mucous string, often a yard in length ; the tadpoles are smaller than those of the frog. The general colour of the Toad is blackish grey, with an olive tinge, the tubercles which stud the surface being brown ; the underparts are yellowish white, sometimes spotted with black. Large specimens attain a length of three and a half inches.

Few creatures have been misunderstood and maligned more than the Toad. In olden times it was supposed to be capable of spitting poison with deadly effect ; and when it attained the age of fifty years it acquired venomous fangs like the serpent. Yet in reality it is harmless and useful, devouring worms, slugs, caterpillars, earwigs, etc., to such an extent that many market gardeners are only too pleased to purchase Toads and set them at liberty in their grounds. Nevertheless, it possesses an unpleasant feature that is absent in the common frog. When danger threatens, it exudes



NATTERJACK TOAD

a substance from the pores of its skin that is so acrid and irritating that, while a dog will bite a frog, it will hesitate to treat a Toad in a similar manner. Generally, however, one can be carried in the hand, and if held up to leaves on which insects have settled, it will dart out its tongue and snap them up with lightning quickness.

The Natterjack Toad (*B. calamita*), three inches in length, is found in many parts of England. It may be known from the preceding species by the shorter hind

legs, the more prominent eyes, and the less webbed feet. The upper parts are light olive with a yellow line along the middle of the back, and there are black bands on the legs. It is less aquatic than the Common Toad, only resorting to water for breeding purposes. Probably nowhere more than in France is there a deeply rooted objection to toads; but the persons who catch frogs for market make no distinction, and when the skin is stripped off the hind legs of a toad they are skewered with those of frogs, and nobody the wiser.

The Giant Toad (*B. marinus*) has a good claim to its title, for it is often six inches long and four inches broad, when squatting. Its rough, warty, dark brown upper parts are patched with a darker



GIANT TOAD

shade; and there are sooty blotches on the whitish under parts. It is a native of America, ranging from Mexico to as far south as Argentina. It utters a cry that is a mixture of snore and bark. Insects form a great part of its food; and one of these immense toads has been seen to snap up mosquitoes at the rate of fifty a minute.

The Midwife-Toad (*Alytes obstetricans*) is a European aquatic species. The female lays her eggs in long strings, which the male twines round his legs and thighs. He hides himself in clefts and crevices near the bank until the eggs are nearly hatched, when he returns to the water. The tadpoles emerge from the eggs to commence independent life, and the male toad is then freed from further parental cares.

The Surinam Water-Toad (*Pipa americana*), with its depressed and triangular head, is one of the most unprepossessing of the amphibians; and it is another creature that brings its young into

the world in an extraordinary fashion. In the breeding season the back of the female becomes quite spongy, and forms a series of cells for the reception of the eggs, which are placed in position by the male. Each cell closes over and completely hides the egg within it, until it is incubated nearly three months later. Sixty or seventy young toads breaking through the broken skin of their mother is a curious, not to say rather startling sight.

ORDER: URODELA
THE TAILED AMPHIBIANS

The Salamanders and Newts are called the Tailed Amphibians because they retain that organ throughout their lives. The production of the young differs considerably from the methods noticed in the preceding order, and even among themselves the Urodela exhibit much variation. The typical Salamander gives birth to living tadpoles, some species breeding in water and some on land. The Newts wrap each of their eggs separately in a leaf of an aquatic plant, so that they are protected from fishes and insects that would prey upon them.

FAMILY: SALAMANDRIDÆ

The Spotted Salamander (*Salamandra maculosa*) is the best known of three species, neither of which is found in Britain. It is a native of Central and Southern Europe, parts of Northern Africa



SPOTTED SALAMANDER

and Syria. It is a terrestrial species from seven to nine inches in length; it usually only frequents water for the purpose of depositing its young, which generally are just leaving the eggs. The Salamander is slow and timid, hiding itself in a crevice during the day. It feeds on slugs, insects, and similar creatures. The ground colour of this species is black, and the spots are light yellow. Along the sides are scattered numerous small tubercles.

Remarkable ideas were once current concerning the Salamander. It was supposed to be able to pass unharmed through a glowing furnace ; and an old writer advised any person bitten by it to betake himself to a coffin and winding-sheet, for he could not recover, even if waited upon by as many physicians as the Salamander had spots. Behind almost all natural history absurdities there is generally at least an atom of truth. The Salamander exudes a poisonous fluid from its skin, which injures any small creature that takes the amphibian in its mouth ; and this same fluid probably would enable the Salamander to pass quickly through a moderate fire before the flames could lick up the moisture.

The Common Newt, Eft, or Evat (*Molge vulgaris*) is abundant in any clear pond or ditch in Great Britain, and is widely spread



CRESTED NEWT

through the greater part of Europe and temperate Asia. It is about three and a quarter inches in length. Its upper parts are generally brownish grey, the under parts are orange spotted with black. The Crested Newt (*M. cristatus*) attains a length of nearly six inches, of which the tail occupies nearly one half. Only the male is furnished with a crest. Its back is coloured blackish or olive-brown, with darker circular spots ; the under parts are rich orange-red, sprinkled with black spots, and along the sides are white dots. During the breeding season the colours are brighter, and the tail of the male is generally adorned with silvery bands along its sides.

The Newt feeds upon small worms, insects, and similar creatures, and may be captured by the simple process of tying a worm on a thread by the middle, so as to allow both ends to hang down, and

then angling as if for fish. The Newt is a ravenous creature, and when it catches a worm, closes its mouth so firmly that it may be neatly landed before it loosens its hold.

All the Newts possess singular powers of reproducing lost or injured members, which proves them to hold a rather low place in the scale of creation. One of these creatures has been known to reproduce a tail, and even the limbs; and in one case an eye was removed entirely, and reproduced in a perfect state by the end of the year. Under all circumstances they are wonderfully tenacious of life, and if enclosed in dried mud, or frozen in a block of ice, a shower of rain or a thaw restores the apparently dead to life again.

The remaining Amphibians can receive little more than passing mention. In the family Sirenidæ are two remarkable North American Salamanders, quite eel-like in form and which, though furnished with fore-limbs, lack the hinder ones. Their eyes are not fitted with lids, but simply shine through the transparent skin. The Mud-Eel (*Siren lacertina*) is one of these strange creatures. It inhabits ponds and ditches, into the banks of which it burrows.

The Olm (*Proteus anguinus*) is the chief representative of the family Proteidæ. In the body it is almost as eel-like as the preceding amphibian; but its tail is flattened, and it has two widely separated pairs of limbs. It is about a foot in length; it is pale faded flesh-colour with a wash of grey. Its home is in certain subterranean waters, chiefly in Carniola and Dalmatia. Living in complete darkness, it has no use for eyes, which are buried beneath the opaque skin. The Proteus does but afford an example of the strange and wondrous forms of animal life which doubtless yet remain to be brought to light in unsuspected nooks of the earth.

In the order Apoda are comprised the Footless Amphibians, of which there are only a few representatives, forming the single family Cœciliidæ. Whether it belong to India, Central Africa, or Central and South America, the Cœcilia is like a slimy-skinned worm, between one and two feet in length, with a rather flattened head, in which the eyes are either absent altogether, or too deeply sunken to be of any use. The female generally lays her eggs in a cluster, round which she coils herself until they are hatched. The young ones do not take to the water until some time after birth, but in later life become so thoroughly terrestrial that they will drown in water.

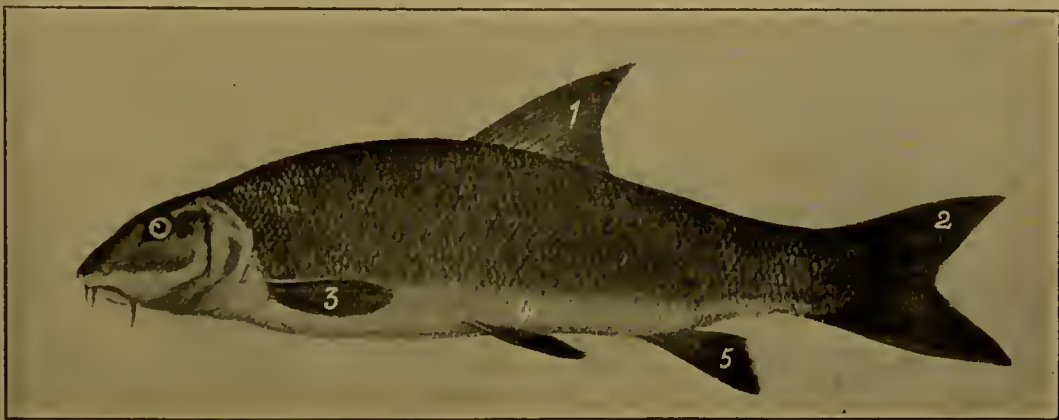
FISHES

CLASS : PISCES

THE FISHES

THE Fishes, the last class of the vertebrated animals, are expressly adapted for a sub-aqueous existence ; for by means of their 'gills,' which are beautiful respiratory organs, they can extract from the water sufficient oxygen for the aeration of the blood, without coming to the surface to breathe. Fishes die when removed from the water because the gill membranes dry against each other, thus closing the orifices and stopping the circulation of the blood. The endurance of any Fish out of water depends entirely upon the capacity of its gills for retaining moisture. A herring will die almost immediately it is removed from its element ; a carp will live an astonishingly long time after its removal ; while the climbing perch actually travels over land from one pool to another.

The shape of Fishes is very varied, but whatever the form may be, it is that which is best calculated to attain rapid propulsion through the water, for the securing of prey, or the avoidance of enemies. The general shape is that of a couple of wedges joined together at their bases. Various strange species, at first glance, scarcely appear to conform to this statement, but even in these cases, in the main is presented a simple outline, far outweighing the over-development of certain more or less unimportant features.



FINS OF A FISH (BARBEL)

Beginning at the head, and following the line of the back, we come upon a fin, called from its position the 'dorsal' fin (1) ; in species where there are two such fins, they are called from their

relative positions, the first and the second dorsal fins. The extremity of the body is furnished with another fin, popularly called the tail, but more correctly the caudal fin (2). The paired fins which are set on that part of the body which corresponds to the shoulders are termed the 'pectoral' fins (3); the paired fins which are found on the under surface and in front of the vent, are called the pelvic or ventral fins (4); and the single fin, which is also on the lower surface, between the vent and the tail, is known by the name of the 'anal' fin (5). All these fins vary extremely in shape, size, and actual position, but in structure they generally consist of a membrane supported by more or less stiff rays.

The power of progression lies in the wonderfully muscular tail, with its appended fin. The creature drives itself forward by repeated strokes of this organ in exactly the same manner that a sailor urges a boat through the water by the backward and forward movements of a single oar in the stern. The very elongated Fishes, however, move largely by rapid undulations of the body. The fins are chiefly used as steerers and balancers, and occasionally to check an onward movement. If a Fish be deprived of its pectoral fins, its body takes a downward angle; the loss of the fins on one side would cause it to lean over to the opposite side, and if all the fins were removed, the Fish would float upon its back as though it were dead.

The scales with which most of the Fishes are covered are beautiful in structure, and attached to the skin by one edge, overlapping each other so as to prevent the least possible resistance to the water; some species have the skin practically naked; and in others the scales are developed into plates with an enamel-like surface. Along each side of the Fish runs a series of pores, which give off a mucous secretion from glands underneath the skin. Each scale upon this 'lateral line' is perforated to allow this secretion to oil the outer surface of the body, and reduce friction when the Fish is in motion. The shape and position of the lateral line, and variations in the type of gill covering are largely used in separating the creatures into different species, etc.

The backbone consists of vertebræ, each of which has a hollow socket on both sides, the rim of one socket fitting closely to that of the next. The hollow ball between the two is filled with an oily fluid, causing the edges to move freely upon each other, and thus giving the body of the Fish the highest degree of flexibility, and a general mobility exceeding that possessed by a bird. In order that a Fish may be able to rise or descend in the water, it is furnished with an air bladder, for the vertical tail only gives a forward motion, and not upwards or downwards like the horizontal tail of the whale. When special muscles constrict the membranous air-bag, the Fish sinks, while the relaxation of the muscles permits the bladder to expand, and the creature rises again. The heart is very simple,

consisting of only one auricle and one ventricle, and, in consequence, the blood is cold. The hearing on the whole is dull ; the sense of touch is seated chiefly in the mouth and surrounding parts ; and the smell is probably strongly developed. The brain is small, and denotes a low degree of intelligence.

Most of the Fishes are carnivorous, and they are well provided with teeth ; they all point backwards for seizing and holding, but not for tearing or chewing, in consequence of which the prey is swallowed whole. Sometimes teeth are present in the roof of the mouth ; in some instances even in the throat ; and in the case of the Saw-fish the snout is prolonged into a blade of bone, the edges of which are furnished with saw-like teeth. Sea Fishes are more voracious as a rule than those that inhabit fresh water. Some species actually devour prey bigger than themselves, while the Skipjack is the weasel of the Fish tribe, killing far more other fishes than it needs to satisfy even its practically insatiable appetite.

The young of Fishes are almost invariably produced from eggs, which are eagerly eaten by other Fishes and various marine creatures, and therefore each Fish deposits a very large number of eggs at a time. An average-sized salmon lays about 15,000 eggs ; a sturgeon deposits 7,000,000 ; a cod, 9,000,000 ; and a ling, 150,000,000. Some eggs are laid in viscid masses, like frog and toad spawn, but generally they are separate, and float entirely at the mercy of wind and tide ; in some cases they sink to the bottom and are covered over by the parent fish for protection, and in other cases they are affixed to rocks, plants, etc. The male of one species of cat-fish carries the eggs in his mouth until they are incubated ; and another species embeds the eggs in the spongy skin of the abdomen until they are hatched, reminding one of the Surinam toad, which hatches her offspring in the skin of her back.

Many interesting features in the life-history of Fishes, such as migration, hibernation, coloration, etc., must be dealt with when the points arise in connection with various selected species.



SAW-FISH

The scientific terms used in the classification of the Fishes, if not actually repellent, are polysyllabic to a degree ; but harsh-sounding technical language will be avoided wherever possible in what can be only a brief and chatty account of a class of vertebrates that is the largest and most widely distributed. Naturalists differ concerning the classification of all living creatures, and in none more than in the Fishes ; but in the following pages is followed the generally acceptable arrangement that is in favour at the British Natural History Museum. The whole class is divided into four sub-classes :

- | | | | |
|--------------------|---|---|--------------------------|
| 1. Elasmobranchii. | . | . | Sharks and Rays. |
| 2. Holocephali | . | . | Chimæroids |
| 3. Dipnoi | . | . | Lung-Fishes |
| 4. Teleostomi | . | . | Ganoids and Bony Fishes. |

ORDER : SELACHII

SUB-ORDER : SQUALI

THE SHARKS AND DOG-FISHES

At the outset it may be understood that the difference between a Shark and a Dog-Fish is that of size only. The outstanding feature of the whole group is the nature of the internal skeleton, which consists of cartilage rather than bone ; in fact, it almost may be said that from the biggest member to the least, they do not possess a real bone among them, and hence are known as the Cartilaginous Fishes. Two other prominent features are the rather shovel-shaped snout, and the mouth placed beneath the head.

There are several species of shark-like fishes that are plentiful on our own coasts. The best-known are the Smaller Spotted Dog-fish (*Scyllium canicula*), and the Larger Spotted Dog-fish (*S. catalus*), belonging to the family Scylliidae ; the Piked Dog-fish (*Acanthias vulgaris*), and the Smooth Hound (*Mustelus vulgaris*) are members of the families Spinacidæ and Carchariidae respectively.

The Larger Spotted Dog-fish is from two to three feet in length, and weighs about 20 lbs. In colour the upper parts are brownish grey, slightly tinged with red, and marked with dusky spots ; the under parts are whitish. The skin is rough and file-like. The Spiny, or Piked, Dog-fish, from three to four feet in length, is bluish above and yellowish beneath. It has a single sharp spine in front of each of its two dorsal fins. In this species the eggs are hatched within the body of the female ; but in most species of the Shark tribe the egg is curious in form and structure. In shape it is oblong, with curved sides, and at each angle there is a long tendril, having a strong curl. The use of these appendages is to enable the egg to cling to growing seaweed at the bottom of the ocean, and to prevent it from being washed away by the tide. These objects are familiar to seashore visitors under the name of mermaid's purses, etc.

Dog-fishes sometimes frequent our coasts in incredible numbers, taking the fisherman's baits and doing much damage to the nets. The rough skin, when dried, is used in wood polishing.

In the same family as the Smooth Hound are the two marine monsters that are most dreaded by man. The Blue Shark (*Carcharias glaucus*) is common in tropical waters, but is no rare visitor to the British Isles, especially the western and southern shores of Ireland. The upper parts of this Shark are slaty blue; the under parts are white. It commonly feeds upon fish. Attaining a length of fifteen feet, one of these Sharks will do much damage if it get entangled in a fishing-net; and its captors need to exercise great care in despatching it, for a blow with its odd-fluked tail will break a man's leg, or crush his ribs with ease.

The White Shark (*C. lamia*), the dreaded ghoul of the warmer waters of the globe, is, happily, almost a stranger to our coasts. It often attains a length of from twenty to thirty feet, and nearly forty feet is not unknown. Its open jaws will take in the thigh, or even the body of a man, and its stomach is of great size and exceedingly dilatable. It swims with the greatest velocity, and untiringly keeps alongside the fastest liners, which it often accompanies to pick up any refuse that is thrown from the vessel. The voracity of the White Shark is almost incredible, for it appears to be in a state of perpetual and agonising hunger, that will lead it to gulp down a bag of cinders purposely cast into the sea to test its amazing appetite. There is scarcely a port or harbour in warmer climes that has not witnessed dire tragedies, only equalled by the awesome records of the crocodiles in fresh water. It is said that the Blue Shark ignores dark-skinned natives, while it will instantly devour white men; but the White Shark makes no such distinction, and misses nothing that will appease its aching maw. There is something terribly gruesome in the shadowy form of a Shark, even when viewed from a safe ship's deck, but when the sinister brute rolls partially over to display the glistening cavity of the mouth the spectator can seldom repress a cold shiver. Not only are the edges of the Shark's jaws lined with saw-like teeth, but the palate, tongue, and even the throat are similarly furnished.

The Great Blue Shark (*Carcharodon rondeletii*) frequently grows to a length of forty feet. It is a veritable man-eater, and the most formidable of a terribly ferocious tribe.

The Basking Shark (*Cetorhinus maximus*), a native of northern waters, attains a length exceeding thirty feet. It is quite common in the neighbourhood of Iceland, where it is regularly hunted for the sake of its oil. Notwithstanding its size, and its cavernous mouth, this huge fish is perfectly harmless unless attacked, when it is no unusual thing for a boat to be smashed by blows of its tail. It preys chiefly on shoals of small fishes. The Basking Shark (*Rhinodon typicus*) belongs to the family Rhinodontidæ. Gigantic creatures

forty-five feet long have been caught in the Indian Ocean, but it is believed to attain a length of sixty feet. It is undoubtedly the



BASKING SHARK

largest of the whole tribe, and is often called the Whale Shark. The specimen in the accompanying photograph was caught off the coast of Cornwall.

The head of the Hammer-head Shark (*Zygæna malleus*) is expanded laterally in a most singular manner, bearing, indeed, no small resemblance to the head of a hammer. The eyes are placed at either end of the projecting extremities, and the mouth is set quite below. Growing to a length of fifteen feet, the Hammer-head bears the character of being one of the most voracious of its tribe; and it is a cause for thankfulness that it only occasionally straggles into British waters.

The Thresher, or Fox, Shark (*Alopias vulpes*) is a member of the family Lamnidæ. It grows to a length of fifteen feet, of which about half is taken up by the very elongated caudal fin. It feeds largely on such fish as the herring and mackerel, beating the waters with its long tail in order to cause the fish in a shoal to pack closely together, the better for preying upon them. The Thresher often unites with the sword-fish and the grampus to make a joint attack upon a whale (p. 224). Some naturalists rather discredit such a fighting alliance, but, on the other hand, are not lacking very cir-

cumstantial accounts of eye-witnesses of these amazing combats. Mr. Frank Bullen, for example, declares that the Thresher, with its flail, delivers terrible blows that cut from the back of a whale strips of blubber, five feet in length and four inches in width.

SUB-ORDER : RAII

THE RAYS AND SAW-FISHES

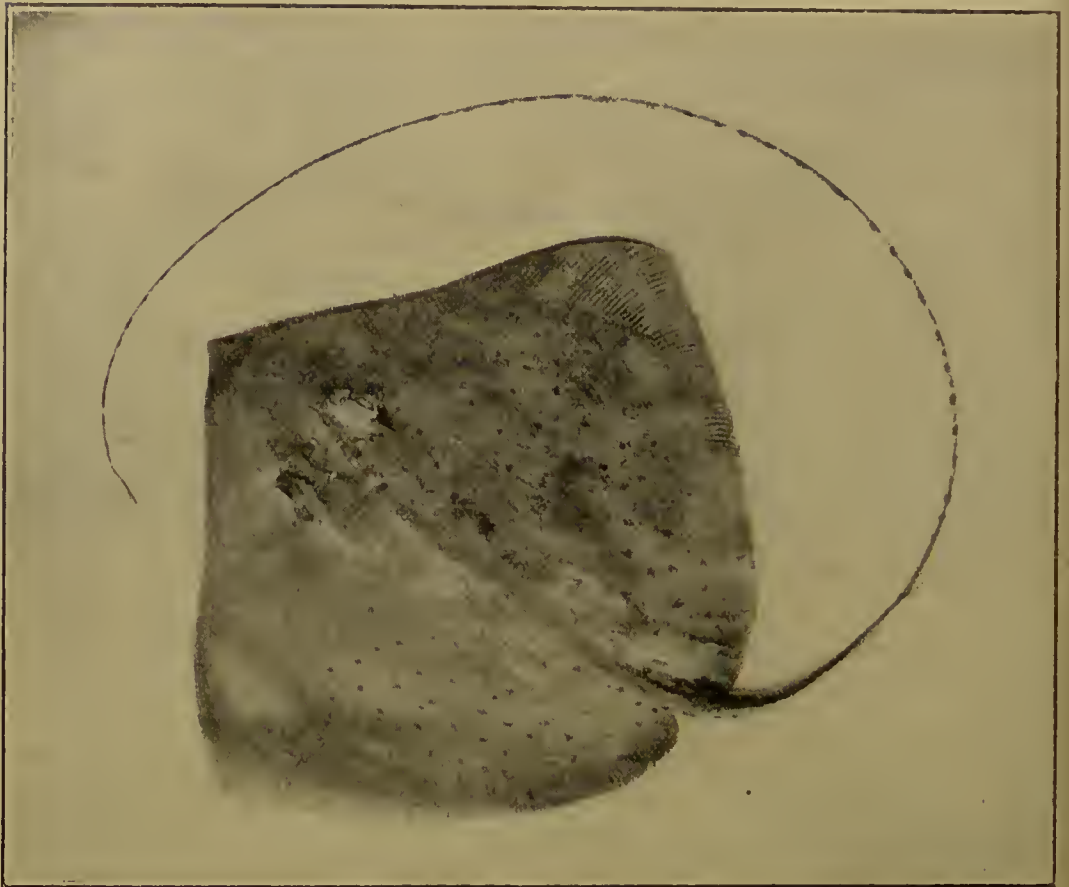
In the true Ray or Skate (Family: Raiidæ) the forepart of the body is flattened and expanded into a disc-like form. The Common Skate (*Raia batis*) is generally between two and four feet in length, and weighs about 90 lbs. It is plentiful on all our coasts, voraciously devouring all kinds of fish, crustaceans, etc. It can break up the stony shell of a crab with ease, which indicates the crushing-mill kind of teeth with which its mouth is furnished. The Thornback Skate (*R. clavata*) is another common example. It is so called because of the tubercular spines which are sown profusely over the whole of its upper surface. The tail has a double row of bony thorns. When angered, the Skate bends its body like a bow, so that the tail nearly touches the snout, and when the spiked weapon is released, it inflicts a most painful stroke. British fishermen catch many Skates, which are exported chiefly to France and Holland, where the flesh is more appreciated than in this country.

The Marbled Electric Ray (*Torpedo marmorata*), a member of the family Torpedinidæ, frequents the Mediterranean Sea, and the Atlantic and Indian Oceans. It has the power of emitting at will electrical shocks of considerable intensity. The object of this unusual power appears to be twofold, namely, to defend itself against foes, and to benumb the swift and active fish upon which it feeds. From the stomach of one of another species, captured in British waters, was taken a fish 5 lbs. in weight, which bore no external sign of injury, proving that the electrical shock had deprived it of the ability to struggle against its fate.

The largest of the Rays is the Devil-fish (*Dicerobatis*) of the tropical seas, which sometimes measures eighteen feet across the disc and scales quite half a ton. The Whip-tailed Sting Ray (*Trygon pastinaca*) is one of many species that possesses a long, flexible, whip-like tail, which is armed with a projecting bony spine, sharp at the end, and furnished with sharp cutting serrations. When on the offensive, the Sting Ray strikes its tail around its opponent in lasso fashion, and thus holding him tightly, wields the barbed spine with frightful and dangerous effect.

The Saw-fish is unique in a class that does not lack many strange representatives. Its upper jaw is greatly prolonged, flattened like a sword-blade, and edged with ivory teeth, set about three-quarters of an inch apart. One species (*Pristes antiquorum*), which inhabits the Atlantic and the Mediterranean, commonly attains a length of

eighteen feet ; but some species in tropical Asiatic waters measure twenty-four feet, of which the saw accounts for about a quarter. In the case of such a monster the weapon will be a foot in width. The fish uses its toothed blade by blows to the right and left, and as it passes through a shoal of fish it leaves a trail of dead and maimed victims behind it, which later the saw cuts into fragments for swallowing. A monster Saw-fish has been known to cut a bather in two, and quite easily it rips portions of blubber from a whale, taking care to avoid the strokes of the tortured animal's tail.



WHIP-TAILED STING RAY

Photo IV. Saville-Kent

THE LUNG-FISHES AND CHIMÆEROIDS

Although the Lung-fishes represent a sub-class, their importance rests chiefly on the fact that they are the last survivors of what was once a great race of fishes. They are furnished with ordinary gills, but they can also use the air bladder as a lung, and can breathe by either method. This power enables them to leave the water and search for food on land. The rivers in which the Gambian Lung-fish (*Protopterus annectans*) lives, periodically run dry ; and until the wet season refills the channel, the Mud-Fish, as it is also called, lies torpid in a little mud-hut, in which are

perforated airholes. There are other African and American species of more or less similar habits.

The family Chimæridæ, a sub-class in itself, comprises only a few species of which the Northern Chimæra (*Chimæra monstrosa*) of the Mediterranean and the Atlantic is a typical representative. It is ugly and ungainly in shape, but the body glows with golden-brown variegations on a white ground, gaining for it the title 'Gold and Silver Fish.' Another name, Rabbit Fish, indicates the general resemblance of its head to the well-known rodent. The creature's backbone is of the type known as 'notochord,' in which the usual separate vertebræ are replaced by an unbroken gelatinous rod.

ORDER : ASTYLOPTERYGII THE GANOID FISHES

The typical fishes of this order are the Sturgeon, Gar-Pike, and Bow-Fin, each of which represents a separate sub-order. Their bones contain a large amount of cartilaginous substance, and are consequently very flexible ; but the bones of the head are firmer, and the skin is more or less covered with hard, bony scutes.

The Sturgeon, of which there are various species in the northern regions of both the Old and the New Worlds, has several rows of bony shields protecting the body, those along the summit of the



STURGEON

Photo A. S. Rudland

back being the largest ; each plate comes to a partly conical spine directed towards the tail. The Common Sturgeon (*Acipenser sturio*) is usually termed the 'Royal Sturgeon,' because any specimen caught in British waters is the property of the sovereign, but the royal prerogative is seldom, if ever, exercised. In olden times epicures greatly esteemed the fish, from which it was said a good cook could obtain beef, mutton, pork, or poultry. This species, which grows to a length of ten or eleven feet, frequents the seas of Western and Northern Europe, the Mediterranean and Black Seas, and the

Atlantic coast of North America ; it is migratory, and ascends rivers for the purpose of spawning. The Russian Sturgeon (*A. huso*) is a much bigger species, often attaining a weight of 3000 lbs. Its home is in the Black and Caspian Seas, and the Russian rivers connected with them. The Volga, in particular, is the seat of a great fishing industry, which not only provides a huge supply of ordinary food for the population, but various other products for home use and export. Isinglass is prepared from the air bladder of the fish ; caviare is the roe, preserved by salting and drying ; and shagreen is the grained fish leather that is used for covering spectacle cases, fancy boxes, etc.

The Sterlet (*A. ruthenus*) is found in the same waters as the biggest of its tribe. It averages less than three feet in length ; but its flesh and caviare are more highly esteemed than that of the sturgeon. Caviare is quite a common article of diet in Russia, but in western countries it is rather an unusual delicacy.

The Gar-Pikes and Bow-Fins, which are principally North American fishes, are voracious species that are of no value as food, and without any special points of interest.

ORDER : TELEOSTEI

THE BONY FISHES

In this immense order are comprised the great majority of all living fishes. They are divided into two main sections, namely, the Physostomi, or the fishes whose air bladders open into their mouths, and the Physoclisti, in which there is no duct to the air bladder of its members. Generally the bodies are covered with thin oval and overlapping scales, only in a few cases is the skin naked or furnished with bony scutes. Bearing largely upon the matter of classification there are many technical considerations, for which any reader desiring more details must consult a work dealing with the subject at greater length.

In the Physostomi are four sub-orders, which include a great number of well-known fishes :—

Sub-order :	Isospondyli	.	Salmon, Trout, Herring, etc.
„	Ostariophysii	.	Carp and Cat-fish.
„	Apodes	.	Eels.
„	Haplomi	.	Pikes.

SECTION : PHYSOSTOMI

FAMILY : SALMONIDÆ

THE SALMON TRIBE

The Salmon (*Salmo salar*) is the king of British river-fish, not so much for its size as the silvery sheen of its glittering scales, its wonderful dash and activity, affording splendid sport to the angler,



PLATE XXII

Perch
Trout
Salmon

and last, but not least, the exquisite flavour and nutritive character of its flesh. The largest British Salmon was probably one taken in the Tay; it weighed 70 lbs. It is a migratory fish, annually leaving the sea, its proper residence, and proceeding inland to deposit its spawn. At one time the Salmon frequented numerous English rivers, but the growth of towns and the rise of manufactures have polluted many streams, which the fish has long ceased to visit, and now it is found chiefly in the undefiled waters of the Tweed and rivers further northward, and in various Irish streams. No current is rapid enough to daunt it; it can dart along at a rate of thirty miles an hour, easily surmounting obstacles such as falls, by leaps of ten and fifteen feet. The female buries her eggs in the gravel bottom of the stream; they hatch in from three to four months; the young fry are called 'samlets,' and when they are six or seven inches long they are termed 'pink' or 'parr.' When a year old the young Salmon is called a 'smolt,' and sets out for the sea. It is a perilous passage, for trout, pike, and the full-grown Salmon, to say nothing of predaceous birds, continually prey upon the young voyagers. The smolt that reaches the sea probably measures eight inches in length, but when, four or five months later, it returns to spawn in the river where it was born, the 'grilse,' as it is then called, may weigh several pounds. British Salmon come up from the sea between September and January, and commence their return about May.

The Fraser in British Columbia is the finest salmon river in the world. In July the Salmon shoal is rounding Vancouver Island, and every mile of the lower river is occupied by the fishermen, eagerly awaiting to commence operations. Soon the stream is 'fairly wriggling with fish'; where the bed narrows the level of the water is raised, and so great is the pressure of the fish behind, that quite big Salmon are pushed out of the water on to the banks. At various points the river is divided into pounds, which are huge traps, where the Salmon are taken in thousands in nets, which are lifted by cranes on small steamers. These fish are conveyed to the canneries, where they are boiled and hermetically sealed in tins. It is nothing unusual for British Columbia to export twenty million tins of Salmon in a single year.

Nevertheless, of the myriads of Salmon many forge ahead and in due course arrive in the higher reaches of the river. Bears scoop out the fish as they glide along the edge of the bank; eagles swoop down and drag fine specimens to land; and the Indian brave, his squaw and children, with spear and net, take their toll, so as to have dried Salmon in store for winter use. But sufficient fish reach their breeding grounds to replenish their depleted forces, and thus prepare to provide another fish harvest in due season.

The Sea Trout, or Salmon Trout (*S. trutta*), is of very similar spawning habits, but its flesh is not of such excellent quality. The

largest of this species are commonly called Bull Trout, and in South Kensington Museum is a specimen that weighed 55 lbs.

The bright-scaled, carmine-speckled, active Brook Trout (*S. fario*) is perhaps the greatest favourite of the angler. Its strength, agility, and spirited courage in endeavouring to free itself from the hook, are sporting excellences rarely met with in any individual fish. It is found in rapid and clear-running streams, preferring the shelter of some stone or hole in the bank from which to watch for its prey. The average angler accounts himself fortunate when he lands a fish of from 2 lbs. to 4 lbs. in weight. Specimens over 10 lbs. are rare in Britain, but in 1907, in the New River, was caught a magnificent Trout that weighed 18 lbs.

The Rainbow Trout (*S. irideus*) is a native of North America, and is seen at its best in streams in the Rocky Mountain regions.



RAINBOW TROUT

It has, however, been introduced into British rivers with marked success, its acclimatisation resulting only in a slight loss in the brilliance of its colours.

The Grayling (*Thymallus vulgaris*) and the Smelt (*Osmerus eperlanus*) belong to the same family as the salmon and trout. The last named is of particularly delicate flavour. A near ally is the Oolachan, or Candle Fish (*Thaleichthys pacificus*), a native of the Fraser and neighbouring rivers. It is excellent eating, but often serves an entirely different purpose. Its flesh is of so oily a nature that, if a cotton wick be threaded through the body, it makes a very serviceable candle, which burns with a bright light for a considerable time.

FAMILY: CLUPEIDÆ
THE HERRING AND ITS KINDRED

The Herring (*Clupea harengus*) is one of our British fishes that could ill be spared ; it is eaten by rich and poor ; it is capable of preservation for a long period ; and it is equally good, whether fresh, salted, smoked, or potted. During a great part of the year this fish lives in deep water, but at certain seasons approaches our coasts in immense shoals for the purpose of depositing spawn in shallow waters. The great Herring catch commences at Stornaway in April, and the shoals move round the coast until October, when Yarmouth is the centre of operations. Every available boat puts out ; five hundred northern craft come to assist, and Yarmouth is



HERRING

invaded by several thousands of Scottish lassies, who gut the herrings for packing, or slit them for kippering. In one day the take may total 50,000,000 Herrings, and steamers, heaped to their bulwarks with barrels and cases, daily cross over to the Continent to dispose of the spoils. During the year about 8,000,000 cwts. of Herrings are netted by British fishermen, their value amounting to more than £2,000,000 sterling.

The Sprat (*C. sprattus*) is a smaller fish that is so abundant on our coasts, that frequently in some of our large towns it is sold at two pounds for a penny ; and when the supply exceeds the demand myriads of them are converted into manure for agricultural fertilising purposes. This little fish lends itself well to curing, but its very plentifulness gives it a plebeian stamp. Nevertheless, many persons who view Sprats with disdain, often unwittingly partake of them when they are packed in oil and sold as sardines.

The very small fishes known by the name of Whitebait are the fry of herrings and sprats. They are considered a great delicacy. Every year the members of the British Cabinet and the Lord

Mayor and Aldermen of the city of London used to partake of a Whitebait dinner at Greenwich. Thames Whitebait are caught between February and August at the rate of about half a ton a day.

The Pilchard (*C. pilchardus*) seeks warmer water than the herring, from which it may be distinguished by its smaller size and the position of the dorsal fin, which in the Pilchard is in the centre of the body, while in the herring it is placed more towards the tail. This fish is only found on our coasts in Devon and Cornwall and the south of Ireland, from whence it ranges to Madeira and the Mediterranean Sea. The chief catch is not during the spawning, but the feeding migrations. The importance of the Pilchard to Cornwall alone is marked by the annual take, which amounts in value to £30,000 per annum. Sardines are young Pilchards, the largest shoals of which are found on the coasts of Sardinia, hence the popular name they bear. The French chiefly engage in the Sardine fishery. The fish, fresh and salted, are sold all over France, while millions of them are preserved in oil in airtight tins.

The Anchovy (*Engraulis encrasicolus*) is only an occasional visitor to British waters; its chief habitat is the Mediterranean and, to a lesser degree, the Zuyder Zee and other Dutch waters. It is from five to seven inches long; its upper parts are bluish green, and the lower portions are silvery white; the fins are tinged with green and are beautifully transparent. The flesh of the little fish is utilised in the preparation of Anchovy sauce or paste, which is so greatly esteemed that there is a temptation to dishonest dealers to substitute sprats and other common fish, with various colouring matters, to imitate the real article.

Although there are many other members of the sub-order Isospondyli, the account must close with two giants of their tribe. The Tarpon (*Megalops atlanticus*), notwithstanding that it grows to a length of seven feet and a weight of 100 lbs., is practically only a big herring. It is a native of the warmer waters of Florida and adjacent regions; but it frequently passes up rivers and enters inland lakes. It usually makes its presence known by leaping several feet out of the water; and a fish so immense cannot fall back into its element without a considerable commotion. A 25 lb. salmon on the end of a line taxes an angler's powers to the utmost to land it; but a Tarpon affords far more strenuous sport, and is accounted one of the greatest of game fishes when caught by rod and line.

The largest freshwater bony fish is the Brazilian Arapaima (*Arapaima gigas*), often measuring fifteen feet, and weighing 400 lbs. Its flesh is far superior to that of the preceding fish. Even this huge creature is caught by means of hook and line; but the natives frequently secure it by shooting it with arrows to which lines are attached. Salted Arapaima is a standard food among the poorer classes in the Amazon regions.

FAMILY: SILURIDÆ

THE CAT-FISHES

This large family includes numerous freshwater species, for although a few of them visit the sea, they never go far from the coast. The body has no scales, but in some cases it is furnished with bony scutes, and in not a few instances there is a formidable bony spine in front of the dorsal and pectoral fins. Around the mouth are from one to four pairs of barbels, which largely give the head of the fish the general appearance that suggests its popular name. The majority of the Cat-fishes inhabit the river estuaries



CAT-FISH

of tropical and sub-tropical regions in both hemispheres. Some species are possessed of supplementary breathing organs; and a few of them live in the mud during dry seasons, not hibernating like the lung-fishes, but crawling out at night in search of food. In one species the eggs are the size of Barcelona nuts, and the male carries them in his mouth until they are hatched. The Cat-fish of the Danube (*Silurus glanis*) is ten feet long, and weighs over 300 lbs. The photograph depicts a North American species (*Amiurus catus*), the male of which always guards the eggs with particular care.

FAMILY: GYMNOTIDÆ

The Electric Eel (*Gymnotus electricus*), notwithstanding its long, sinuous body, often eight feet in length, strangely enough, is not related to the true Eels. It is restricted to the fresh waters of Central and South America. Humboldt related that in his time the natives were in the habit of driving a herd of wild horses into the water where the Electric Eels were known to be present; and the fishes would press themselves against the invaders of their domain, and deliver shocks that often caused some of the poor quadrupeds to drown. After several discharges from its battery a fish was

exhausted, and then fell an easy captive to the native fishermen. Modern travellers do not corroborate Humboldt's statement, but, nowadays, horses would not be sacrificed merely to obtain a supply of fish food. Electric Eels have been kept in England in a living state, and fishes introduced into a tank were struck as if dead by the violence of the shock delivered by the strangely armed Eel.

FAMILY : CYPRINIDÆ

THE CARP AND ITS ALLIES

The Common Carp (*Cyprinus carpio*) is not so brightly spotted as the trout, and its flesh is very inferior, but it is held in some regard by anglers because of its extreme cunning. A number of Carp may be taken one day and none at all for perhaps a week afterwards, the suspicions of the fish having been aroused, so that it declines to meddle further with anything that may conceal a hook. Even a net is often unavailing against its wiles, for it will bury itself in the mud, and allow the net to pass over it. The flesh of the Carp is only used in inland regions where marine fish are not available. When kept in ornamental waters, this fish sometimes lives to the age of fifty or even a hundred years. In such situations a length of four feet and a weight of as much as 50 lbs. are not uncommon. These great creatures become remarkably tame, quite losing the inherent dread of man, and learning that the biped on the bank in all probability will indulge their appetite with favourite food.

The beautiful Golden Carp, or Gold-fish (*C. auratus*), is a native of China and Japan, from whence it was introduced into Europe and America to adorn aquaria and ornamental ponds in parks and gardens. As a result of domestication and artificial selection, there are all varieties of colour, including an albino form.

The Barbel (*Barbus vulgaris*) is common in many English rivers. It may be recognised easily by the four fleshy beards or barbels, which hang in pairs from the nose and the angle of the mouth. It is a mud-loving fish, grubbing with its nose in the soft banks for the larvæ of aquatic insects. In colour the fish is brown above with a green wash, and the sides are yellowish green; the abdomen is white. It quite commonly grows to a length of two feet, with a weight of 10 lbs.; but 18 lb. Barbels are not unknown.

The Gudgeon (*Gobio fluviatilis*) only attains a length of about six inches, and large specimens seldom exceed a quarter of a pound in weight, but a dish of them is not to be despised, for the flesh is particularly delicate. The fish is mainly grey in colour, with dark blotches on the upper parts. The ease with which it is taken has passed into a proverb. If one stir up the gravel, and suspend a worm in the turbid water, the bait will be snapped up eagerly.

The Bream (*Abramis brama*) differs from all other British fresh-water fish in the great depth of its laterally compressed body

and the elongated base of its anal fin. It frequents both rivers and lakes. Our native specimens generally average from 2 to 4 lbs., but three times the latter weight is on record. The colour of the Bream is yellowish white, except the cheeks and gill covers, which are lustrous silver. The angler finds that this fish provides poor sport, for no sooner is it hooked than it rises to the surface. Although it was formerly viewed as a great delicacy, its flesh is not now in much favour.

The Tench (*Tinca vulgaris*) is greenish olive in colour, with a fine golden wash; it attains a weight of 4 or 5 lbs. It prefers the slowest and muddiest of rivers, and will thrive in lakes, or even clay pits. No water seems to be too muddy or too fetid; yet even where the stench of the mud is a sore trial to the fisherman, the Tench will not only be of good size, but of remarkably sweet flavour. In the winter months the fish buries itself in the mud, and there remains until the succeeding spring.

The Roach (*Leuciscus rutilus*) is a common species all over Central and Northern Europe. It is a pretty fish, the upper parts of the head and body being greyish green, glossed with blue, the abdomen silvery white, and the sides passing gradually into white from the darker colours of the back. The pectoral, ventral, and anal fins are bright red, the former having a tinge of yellow, and the dorsal



ROACH

and tail fins are brownish red. The capricious habits of the Roach call for delicate skill on the part of an angler. It is exceedingly sensitive to the least change in weather conditions, and an adverse breeze or an alteration in temperature may at once put the fish off its feed, when no bait will tempt it to the hook. If the conditions are favourable, an angler who has studied the habits of the fish will succeed in his beloved sport throughout almost all the

year, the winter months being the favourites ; yet at the same time and place an inexperienced angler may not get a single bite. The Roach is gregarious, swimming in considerable companies close to each other. It is a species that does not run to a great size ; 1 lb. specimens are considered fine fish, but those of 2 lbs. are rare.

The Chub (*L. cephalus*) is a fish the capture of which reflects credit upon the angler, for it is a wary species, and even when a four- or five-pounder is well hooked, it is no easy matter to land it. It is a handsome fish with a dark green back and white underparts. It is said to add frogs, water-voles, and crayfish to its ordinary diet of small fish. Izaak Walton declared that the Chub was good eating, but he forbore to add that the meat is sometimes lost in a maze of bones.

The Dace (*L. vulgaris*), the Minnow (*L. phoxinus*), and the Bleak (*Alburnus lucidus*) are closely allied to the roach, and call for no detailed particulars.

SUB-ORDER APODES

FAMILY : ANGUILLIDÆ

THE EELS

The Eels are very distinctive in appearance, being long, snake-like and devoid of pelvic fins. In some species even the dorsal and anal fins are lacking, and there is no separate tail fin. If the slimy body is not entirely naked, the scales are small and deeply embedded in the thick, soft skin. There are many species of the Anguilliformes, as the sub-order is also termed, but two familiar and useful fishes will serve for the whole of them.

The Common European Eel (*Anguilla vulgaris*) is widely distributed over nearly all Europe, but is absent from the Danube. It is often popularly supposed that the Eel is a mud-fish, whereas in hot, still, sunny weather in June the Eels are chiefly on the top of the water. Where the cow-weed grows the longest they congregate to bask in the sun, and at night remain in the same spot to enjoy the warmth that is left, while they snap at the myriads of gnats and other insects that seek the weeds for food and rest. They vary their haunts, however, according to circumstances ; in blowing or rainy weather they are to be found in the deep ditches, but if a flush of water come into a stream flowing into the main river, the Eels will work against it as long as it is freshened.

The Eel grows very slowly, and one of four or five pounds in weight will be quite as many years old. Particularly fine specimens have been known to attain a length of from six to eight feet with a weight of 60 lbs. There are piscatorial records of monsters ten feet long and weighing 100 lbs., but one hesitates to give them credence. The males, which are considerably smaller than the females, do not ascend rivers, generally remaining in or very near to the mouth. When the female is several years old, it migrates to

deep sea water to deposit its spawn, after which it dies, no old Eels ever returning to their freshwater haunts.

The young Eels, which are called 'Elvers,' in due course migrate from the breeding grounds to the coast, ascending our rivers in millions. They are very tenacious of life, their gills being modified so as to keep damp for a long time, and thus able to perform their natural functions. Consequently the Elvers are able to leave the streams and crawl considerable distances across fields, until they find ponds and ditches to their liking. Sometimes adult Eels may be seen travelling overland, owing to the drying up of the water in which they have been domiciled ; or they may be in search of running water that will carry them towards the sea.

The Conger Eel (*Conger vulgaris*) is wholly a marine fish ; it grows to a larger size than the common species, from which in any case it always may be distinguished by the position of the dorsal



CONGER EEL

Photo W. Saville-Kent

fin, which commences nearer the head. The male Conger does not exceed a couple of feet in length as a rule, but a female has been known to attain eight feet and a weight of 120 lbs. This fish frequents deep waters where the bottom is rocky ; its prey consists chiefly of crustaceans, cuttle-fish, and always such species as the herring, pilchard, etc. It is generally caught with a line several hundreds of feet long, with the lower portions well twisted, or wired,

to defeat a set of teeth that form a sharp cutting edge. When hauled into a boat, a Conger makes desperate efforts to escape, until it has received a blow on the underparts, which is a more vulnerable spot than the head. The flesh, though coarse, is well-flavoured, but it is not particularly esteemed except in the Channel Islands, where was once a famous Conger fishery, dating back to a charter granted to the islanders by King John.

SUB-ORDER : HAPLOMI

FAMILY : ESOCIDÆ

The Pike (*Esox lucius*) is our freshwater shark. In reality it is no more destructive to animal life than many smaller fishes ; but as it quite commonly grows to a length of four feet, with a girth of two feet and a weight of 30 lbs., and devours creatures of considerable



PIKE

size, its destructiveness is more conspicuous. There appears to be no absolute limit to its size, for it is a long-lived fish and apparently increases its dimensions as long as it is well supplied with food. Some very old Pike have been known to scale 60 lbs.

The Pike is restricted to fresh water, and is known throughout Europe, Asia, and America. Its colour is olive-brown on the back, a lighter hue on the sides, and variegated with green and yellow ; the abdomen is silvery white. It is a solitary fish except during the breeding season. When it attains a tolerable size it selects a particular spot, such as a hole in a bank sheltered by overhanging soil or roots, where it can lurk in readiness to seize its passing prey. Its jaws, and even its palate, are furnished with strong, closely set teeth, and as the points are directed backwards, when once a creature is seized there is little hope of escape.

Endless stories of the Pike's voracity might be recounted. It is particularly destructive to trout and other fish ; it does not hesitate to devour its own kind, and a 20 lb. Pike has been seen swimming about with an 8 lb. relative in its mouth. The fish that gets off lightest is the perch, for its array of sharp spines daunt the gaunt pirate from attempting its capture. Frogs, water-voles, and young waterfowl are regularly preyed upon, although its greed often prevents the Pike stopping to consider age or size. A keeper at Wretton, Norfolk, was watching two waterfowl swimming. There was a sudden rush, and one moorhen was seized from below and dragged under, the cock bird taking refuge in the rushes. Presently the latter got into deep water again, when there was another commotion, and he was seized. The keeper shot below the bird, and had the satisfaction of killing the Pike, still holding fast to its prey. From the external appearance of the fish it was thought to have swallowed the first bird, but examination of its stomach revealed, not a waterhen, but a couple of water-voles, which proved that the first bird had been taken by another Pike.

Included in the same sub-order as the pike is the Four-Eyed Fish (*Anableps tetraphthalmus*), which inhabits the waters of the Mammoth Cave of Kentucky, and other similar subterranean depths. Living in complete darkness, sight would render the fish no service, but in compensation, the Cave Fish, as it is also called, has the senses of hearing and touch very highly developed, the latter especially in various transverse processes on each side of the head. In another respect this fish exhibits remarkable modification to suit its peculiar environment, The greater part of its food is taken on or near the surface of the water, and for the easy capture of its prey, the mouth of the fish is directed slightly upwards.

SECTION : PHYSOCLISTI

Most of the Teleostean fishes belong to this second section of the order. They are divided into seven sub-orders, of which the Acanthopterygii is by far the most important, for it contains most of the marine fishes, many of which are of the highest economic importance, giving rise to no inconsiderable part of our national harvest of the sea.

SUB-ORDER : CATOSTEOMI

THE STICKLEBACKS AND PIPE FISHES

Belonging to the family Gastroteidæ is the Three-spined Stickleback (*Gastrosteus aculeatus*), which provides such excellent sport for the British schoolboy, armed simply with cotton, a bent pin, and a wriggling worm. It is a lively little fish, only about two inches long, and chiefly grey and golden in colour ; but in spring

the male, in particular, puts on patches of red. It takes its name from the three isolated spines in front of the dorsal fin.

One of the chief features of the Stickleback is its astounding pugnacity, and the male is easily the bantam cock of the finny world. About the time of the breeding season the males fight from morning to evening. Two antagonists dart at each other, snapping at the gills or head, and retaining their grasp with the tenacity of a bulldog. They whirl round and round; they feint, attack and retreat with astonishing quickness until one confesses itself beaten and makes off for shelter. The victor's colours take on an added radiance; his back glows with shining green, his sides and head are glorious with golden and scarlet, and his belly is silvery white. If he were only the size of a perch, he would hold his own with any of the gorgeous inhabitants of the southern seas. On the other hand, the vanquished 'soldier' appears to lose half of his radiant apparel,



THREE-SPINED STICKLEBACK

defeat rendering him dull and sombre, until he can meet with success in another encounter and wear the gold and scarlet insignia of victory.

Very often these strenuous fights are in defence of the Stickleback's home and family, for it is one of the few fishes that construct a house as a defence against the numerous foes that are ever in wait for the eggs or the newly hatched fry. The nest is composed of vegetable fibres, waterweed, etc., which the male fastens together with a slime exuded from its body. Several females will deposit their eggs within the shelter, and then the 'soldier' goes on guard, prepared to fight all comers until the young are hatched. It is almost sad to relate that not the least persistent enemies are the female Sticklebacks themselves, who would devour their own eggs, but for the vigilance of their lord and master.

The Ten-spined Stickleback (*G. pungitius*) is another freshwater species that is less common ; but the Fifteen-spined Stickleback (*Spinachia vulgaris*), about four inches long, is a marine fish that is common on most of the coasts of Europe. This fish is born and dies within a year, in which it resembles many creatures of the lower orders and the flowers of the field.

FAMILY : SYNGNATHIDÆ

The Pipe Fishes are marine species. The body is eel-like ; it has no scales, but the skin is either protected by bony plates set almost like a mosaic, or by bony rings which encircle the body. There is only one dorsal fin, and the pelvic fins are absent. The head is prolonged into a tube-like snout. The male fish takes charge of the eggs ; in some species he is provided with a pouch, which is not only a hatching receptacle, but provides a retreat for the young fry for some time after birth. The Greater Pipe Fish (*Syngnathus acus*) attains a length of eighteen inches.

The Sea Horse (*Hippocampus abdominalis*), which is sometimes taken on the British coasts, is every whit as peculiar a creature as its scientific name. With its head bent at right angles to its body, it is at least suggestive of a horse's head, even to two apparent ears that project partly from the sides of the neck. The creature generally carries itself in a vertical position, employing its tail as a prehensile organ. Its one dorsal fin is set far back, and there are no pelvic fins.

SUB-ORDER : PERCESOCES

In this sub-order, which is also styled Mugiliformes, there are many species, some of which differ very considerably in form and habits ; but space will only permit a description of four interesting fishes.

The family Mugilidæ contains a large number of species of which the best-known is the Common Grey Mullet (*Mugil capito*). It is a blunt-headed and nearly toothless fish that lives on small creatures, for which it grubs in the mud and sand, the mouth being fitted with a straining apparatus, by means of which mixed substances are sifted and the useless matter rejected. It often proceeds from salt to fresh water between the tides, and when it is caught in a net it makes the most daring and ingenious attempts to escape. When transported to an inland lake it will thrive as well, if not better, than in the sea. The Grey Mullet is bluish grey above ; the sides are silvery and traversed with longitudinal lines of darkish grey. It generally grows to a weight of 4 lbs., and the flesh is of good quality.

The Climbing Perch (*Anabas scandens*) belongs to the family Anabantidæ, whose members are natives of the south of Asia and Africa. Owing to their snake-like form, without pelvic fins, one

does not marvel at eels wriggling their way over wet fields, but the body of the Climbing Perch is very compressed, and it has a full complement of spined fins. Whether it can climb rough palm stems, as indicated in the creature's several native names, is very doubtful, but that it can cover the ground at a fairly rapid rate is indisputable. To effect progression it holds on to the ground with the spines of the anal and pelvic fins, and hitches its pectoral fins around the stems of herbage. The fish, which is eight or nine inches long, usually travels only in search of water, when its home supply has failed. It is able to live for a considerable time on land, for it has a pair of air-breathing cavities in addition to ordinary gills; and when out of water the latter organs are not used.

The Gar-fish (*Belone vulgaris*) is one of a number of species in the family Scombresocidæ, which are not to be confounded with the Gar-Pike. The species named is found in the whole of the seas of Northern Europe, and is often encountered off the coasts of Britain. Its distinguishing feature is the prolongation of the jaws into a long and almost bird-like beak. Its flesh is not at all bad eating, but many persons view it with suspicion because of the green colour of its bones. The British species is about two feet in length. There are tropical species, however, that grow to more than twice that size, and are somewhat dangerous to fishermen, who have to take care that the fish does not drive its closed beak into their flesh.

The ancients were well acquainted with the Flying Fishes, and believed that as soon as night came on they left the ocean, flew ashore, and there slept safely until morning light. The generic name, '*exocætus*,' literally means a 'sleeper out.'

The Flying Fish (*Exocætus volitans*), often called the Flying Mackerel, is a small species, from ten inches to a foot in length, that is sometimes seen off British coasts. The pectoral fins are broadened and lengthened, and the lower lobe of the tail is also enlarged. Though it may be, more or less, agreed that the fish does not really fly, there is considerable difference of opinion exactly how the aerial progress is accomplished. The creature does not flap the wing-like pectoral fins, and it does not appear to be able to change its course. It seems to leave the water by a vigorous movement of the tail, and it scuds through the air for a distance of several hundred yards, upborne by the fins, which act as a parachute until it reaches the water again, when the tail gives it another start. A voyager to South Africa thus describes meeting with Flying Fish during the height of a squall:

"There came a flight of fish, like silver arrows. In the rage of the storm their noiseless flight was all the more noticeable, their long wings radiating with colour as they swept the watery surface and skimmed across the valleys of the waves. For a minute they were above our heads as we sank into the trough; then, as the vessel climbed again, half a dozen of them fell on board."



PLATE XXIII

Flying Fish
Red Fire-Fish

SUB-ORDER : ANACANTHINI

FAMILY : GADIDÆ

THE COD TRIBE

The Cod and its allies are northern fishes, some species frequenting different parts of the ocean in countless legions. At their head is the Cod (*Gadus morrhua*), generally from two to four feet in length, and averaging about a dozen pounds in weight ; but sometimes is attained a weight of 100 lbs. Two distinguishing features are its large mouth and three dorsal fins. There is considerable variation in colour among the nearly twenty different species, but the British Cod is chiefly greenish or brownish olive. The Dogger Bank in the



COD

North Sea, and off the coasts of Iceland and Newfoundland are the seats of three great fisheries, but the last-named is the most famous in the world. In the case of the British fishery the Cod are caught chiefly for immediate consumption, and by means of steam vessels and special fish trains, the catch is speedily brought to market.

In Newfoundland the conditions are different, for the island is remote from the world's great fish markets. The Cod is always taken with the hook and line, not only hand lines, but also, attached to floats and buoys, very long ones, to which many shorter lines are fixed at definite distances. Curing the fish is not a complicated operation. It is beheaded, gutted, and the backbone removed ; it is then placed in salt for several days, when it is washed, dried, and packed into barrels. Most of the salted Cod is exported to the Roman Catholic countries of the Mediterranean and South America, whose people are great fish-eaters during the fasts of their Church. Cod-liver oil, valuable for persons afflicted with delicate

lungs, is produced in large quantities. Quite five thousand vessels take part in the fishing between June and November, and the season's catch averages about £4,000,000 in value. The British Cod fishery is not nearly so large, but, nevertheless, 2,000,000 cwts. are taken by our fishermen, the value of which well exceeds £1,000,000.

There are various allied fishes that are among the most valuable for food. The Haddock (*G. æglefinus*) is marked by a dark patch above each pectoral fin, and a black line along each side. On our shores it seldom exceeds 4 lbs. in weight, but in the northern seas it grows to a length of three feet and a weight to correspond. This fish is eaten chiefly when smoked and dried. The Whiting (*G. merlangus*), Pollack (*G. pollachius*), and Ling (*Molva vulgaris*), are too well known to call for description. Each of them possesses the three dorsal fins, but the Hake (*Merluccius vulgaris*) has only two. Attaining a length of four feet, it is a voracious fish that is particularly fond of hanging on to shoals of pilchards. When captured in a pilchard net, a Hake will gorge itself on the smaller captives until it is scarcely able to move.

The Burbot, or Eel-pout (*Lota vulgaris*), is a species of freshwater codfish that is found in some of our eastern rivers, but not in the Thames. It averages a length of from one to two feet and a weight of about 3 lbs. ; but in some continental rivers it grows to a weight of 30 lbs. ; and the Alaskan Burbot is six feet long and 60 lbs. in weight.

SUB-ORDER : ACANTHOPTERYGII

THE SPINY-FINNED FISHES

Most of the marine fishes being comprised in this sub-order it will be convenient to divide them into a number of typical groups such as the Perches, Mackerels, Flat-fishes, etc. Omitting numerous highly technical characteristics, it may be noted that, except in a very few species, such as the Flat-fishes, " the foremost rays of the dorsal and anal fins are spinous and hard, instead of being jointed and flexible or soft " ; and the gill opening in front of the pectoral fin is generally large. The student who desires fuller, yet concise, technical information should possess himself of the excellent guide books to the Gallery of Fishes issued by the Trustees of the British Museum (Natural History).

THE PERCH TRIBE (PERCIFORMES)

The Perch (*Perca fluviatilis*) is one of the best-known species of this large division of what are mainly marine fishes. It is one of the handsomest of our native fish that, notwithstanding its specific name, is more at home in lakes than rivers. Its colour is chiefly rich greenish brown above and golden white below, the sides being marked with a row of dark transverse bands. The first dorsal fin is brown, touched with a little black, the second dorsal and the

pectoral are pale brown, and the tail and other fins are bright red. The big dorsal fin has an array of formidable spines that cause even the predatory pike to leave this species severely alone. The Perch is a voracious fish, feeding largely upon young minnows, dace, gudgeon, and roach. Generally it frequents rather deep water, but it will sometimes come to the surface and snap at a fly; it has been captured by anglers when fly-fishing for trout.

When the Perch takes a bait it usually hooks itself thoroughly by means of its own stroke, and the way in which it struggles against its captor makes it an especial favourite with anglers. If it is confined in an aquarium it soon recognises the hand that feeds it, and will come to the surface to take food from the fingers. It is not a large fish, 3 lbs. being considered a good weight; specimens of $4\frac{1}{2}$ lbs. are well authenticated, but reported eight-pounders are more likely to be Bass or Sea-Perch (*Morone labrax*), which frequently ascends tidal rivers. This fish, when hooked, makes a brave fight for life. The dorsal fin spines are strong and sharp as packing-needles, and in its twistings and wriggings, anglers often receive rather severe wounds.

The Pope, or Ruffe (*Acerina cernua*), which is common in the north of Europe and Asia, is found in various English rivers, but is absent from Scotland and Ireland. Our native specimens are



POPE, OR RUFFE

seldom more than six inches in length, but in continental rivers it is considerably bigger. How it came to receive the name 'Pope' cannot be explained, but at one time it proved most disastrous to the little fish. During the great religious upheaval in England,

several centuries ago, many people showed their hatred of Roman Catholicism by catching Popes, fixing a cork upon their dorsal spines, and then restoring them to liberty. The unfortunate fishes, victims of a mere name, were unable to do anything but bob about the surface; it was impossible to capture any food, and thus they died a lingering death.

The North Sea, adjacent to our own shores, was at one time one of the richest fishing-grounds in the world, but overfishing by a couple of thousand of steam trawlers, whose nets sweep up big and little fish alike, has sadly reduced the productiveness of these waters. Our fishing fleets now go further afield for their catches; the coasts of Iceland, the White Sea, and almost as far south as the Straits of Gibraltar are regularly visited, the fish being brought alive to our shores in vessels that are practically huge tanks. Consequently various hitherto little-known fishes find their way to our markets. Among them is the Snapper (*Pagrus vulgaris*), whose habitat is chiefly in the Mediterranean and the neighbourhood of the Canary Islands. In appearance it is not unlike a large bream, very massive, and with a flat head.

There is a peculiar interest attached to the Tile-fish (*Lopholatilus chamaeleonticeps*), a native of the American waters of the North Atlantic. It was really only discovered in 1879, and as it ranged from 10 lbs. to 40 lbs. in weight, and its flesh was excellent, during the next three years it proved to be a welcome addition to the food fishes that came to the American market. In March, 1882, millions of dead Tile-fish were floating over several thousands of square miles of ocean. The annihilation of a species of living creatures by the hand of man is not unknown, but the process is generally a gradual one. In this case it was sudden, and due entirely to natural causes, namely, the sudden chilling of the waters inhabited by the Tile-fish. Events have proved, however, that a remnant of the tribe escaped, and the species is again being caught in increasing abundance.

The Red Mullet (*Mullus barbatus*), with its brilliant colouring, is a most attractive-looking fish, and in addition; the flavour of its flesh is unsurpassed. Its back is chiefly carmine-pink, and the underparts are silvery white. It is abundant in the Mediterranean, and in olden times was one of the luxuries for which Greek and Roman epicures were prepared to pay almost fabulous prices, three small-sized fishes sometimes realising as much as £200. This species is but rarely taken on the British coasts, but the Surmullet, or Striped Mullet (*M. surmuletus*), is caught in considerable numbers off the Cornish coast. It is generally less than fifteen inches in length and averages about 2 lbs. in weight; and it may be distinguished easily by three or four longitudinal yellow stripes along its sides. Some authorities are inclined to view it; not as a distinct species, but simply as the female of the common Red Mullet.

The Fighting-fish (*Betta pugnax*) of Siam has a long but narrow dorsal fin, while the anal fin is long and broad. Normally the fish is dull in colour and little likely to attract special attention ; but in the presence of another fish its body glows with metallic colours quite dazzling in their brilliancy. Two of these fishes will fight desperately until they are tired, and the Siamese, who are confirmed gamblers, arrange fights upon which depend, not only large sums of money, but often the liberty of themselves and their families.

The Chætodonts are tropical fishes that largely frequent coral reefs. Their coloration is usually exceedingly brilliant, gaining for them the name of Butterfly-fishes. They are generally small in size, and the body is compressed laterally to a remarkable degree. The dorsal and anal fins are of great size, and the mouth is developed into a tube-like snout, especially in the case of the Beaked Chætodont (*Chelmo rostratus*). Over its head and body are drawn several brownish crossbands, edged with darker brown and white, and in the middle of the soft dorsal fin there is a large circular black spot edged with white.

It is often asserted that this fish uses its snout as a water-pistol, ejecting a spot of water so as to strike a fly down upon the surface, so that it can be snapped up. In all probability the statement is incorrect, and arises from confusing it with the Archer Fish (*Toxotes jaculator*), a native of the Eastern seas from the coast of Arabia to Polynesia. This fish undoubtedly does catch fish in the manner described. Sometimes an Archer is kept in ponds in the East, in order to watch it unerringly aim a jet at a fly upon the end of a rod which visitors hold over the water.

THE MACKEREL TRIBE (SCOMBRIFORMES)

Closely connected with the Perch tribe are the Scombriform fishes, of which the Mackerel is an excellent type, although there are various fishes whose relationship to it one might not have suspected. Some or other of the tribe are abundant in both tropical and temperate seas ; several of them are particularly swift ; and some of them are of great economic importance.

The Mackerel (*Scomber scombrus*), with its dark green-blue back, banded sides, and pink and pale green underparts, is widely distributed along the shores of the North Atlantic in both the Old and New Worlds. It is one of the species that migrate to the shores in vast shoals at certain times of the year. It is usually taken in drift-nets, a number of which are fastened together to form one net, that, when shot, is often over a mile in length. A large buoy, to which is attached the drift-rope, is thrown overboard, and the sails set ; and as the boat scuds along, the nets are heaved over the side to hang in the water from the drift-rope like a net wall. The Mackerel swim into the thin twine meshes, which are too

small to allow the passage of the fish, and the open gill covers prevent the captives withdrawing from the mesh. It is no easy task to haul in a loaded drift-net. and sometimes the catch is so



MACKEREL

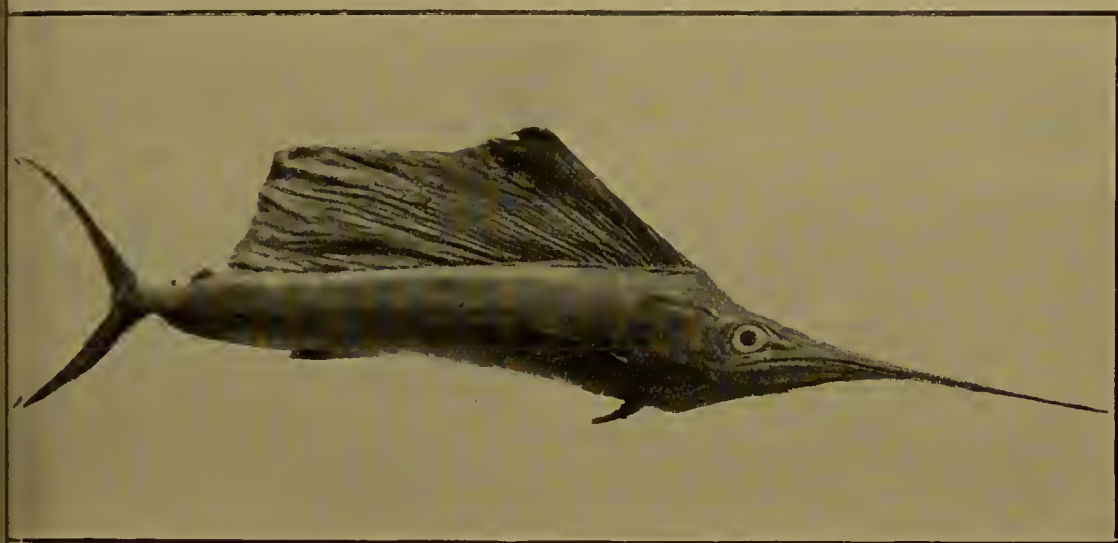
great that the drift-rope has to be cut, the nets and the catch sinking to the bottom, entailing a heavy loss upon the fishermen. Trawl-nets are used when the mackerel are nearer the bottom. The south-west coasts of England and Ireland are the chief seats of the British Mackerel fisheries.

In the same family Scombridæ is the Tunny (*Thunnus thynnus*), one of the giants of the Teleostean order. It averages four feet in length; but it often measures ten feet, while fourteen feet and a weight of 1000 lbs. are by no means rare. The upper part of the body is very dark blue, the abdomen is white with lustrous silver spots. This magnificent species visits our southern coasts, but not in sufficient numbers to make it of commercial importance; one specimen, caught off Weymouth, and now exhibited at South Kensington, is nearly eight and a half feet in length. The capture of the Tunny is a strenuous business, for after it has been brought to the surface in a net it has to be stunned by blows with a long pole. In the Mediterranean countries the flesh of the Tunny is eaten fresh, salted, or preserved in oil; in Italy, in particular, it is made into soup, and cooked in pies that are said to keep for several weeks.

Another member of the family is the Bonito (*T. pelamys*), which is of wider range, being found in many temperate and tropical seas. Often when the flying-fish are very active, it is because they are being pursued by Bonitos, which in turn are preyed upon by the shark and sword-fish.

The members of the family Xiphiidæ are among the most remarkable denizens of the deep. There are various species in the

Indian and Pacific Oceans, but the Common Sword-fish (*Xiphias gladius*) possesses all the characteristic features of the tribe. It is widely distributed between Europe and the opposite side of the Atlantic. Six feet is perhaps an average length, but often the creature attains a length of from ten to fifteen feet, of which the 'sword' itself will account for a yard. This weapon is a development of the snout, and is of such strength and sharpness that 'sword' is no mere figure of speech. In the British Museum is a portion of a ship's bottom into which one of these strangely armed fishes had driven its sword to a depth of twenty-two inches. In another case a wooden naval vessel had its timbers penetrated to a depth of eight and a half inches. It was calculated that a metal bolt, similar in size and shape to the sword, could not be fixed in such tough timber with less than nine blows of a 25 lb.



SWORD-FISH

Photo A. S. Rudland

hammer. This interesting calculation is a testimony to the strength of the thrust of the fish, and the speed which must necessarily be at the back of it.

The Sword-fish preys upon the cod, tunny, and other fish ; it is also known to stab the whale, and probably when ships' bottoms suffer, it is in mistake for the cetacean. Fortunately the Sword-fish is not a frequent visitor to our coasts ; one, seven feet long, was captured off Margate, and many years ago a bather was transfixed in the mouth of the Severn. In colour the Sword-fish is bluish black above and silver white below. Some species have an enormously large and high dorsal fin, which acts almost like a sail when the fish is on or near the surface, and, in fact, it is often called the Sail-fish. In Mediterranean countries, and also in America, the flesh of the Sword-fish is considered to be a very passable substitute for salmon.

The Pilot-fish (*Naucrates ductor*) is so named because it was

formerly supposed to act as a scout for the shark, leading it towards prey of which it would be otherwise unaware. Modern naturalists make light of the pretty fable, inclining to the belief that the Pilot attaches itself to the shark from purely selfish motives, obtaining no inconsiderable part of its food from the parasites that infest the carcase of the bigger fish, as well as coming in for scraps when it is feeding. It is even asserted that the shark would devour its companion, but for its watchfulness and agility. The Pilot-fish is about a foot in length; its colour is greyish blue, with five bands of a darker shade passing completely round the body.

THE FLAT-FISHES (ZEORHOMBIFORMES)

In this group are two families, namely the Zeidæ (John Dory, etc.), and the Pleuronectidæ (Plaice, Sole, etc.), although it is only the latter family that comprises the Flat-fishes in the real acceptance of the term.

The John Dory (*Zeus faber*) is very peculiar in shape, the body being deep and greatly compressed. The head is markedly odd in



JOHN DORY .

form, and the mouth can be protruded to a surprising extent. The spines of the first dorsal fin are prolonged, and behind each ray is given off a long, waving filament. Along the base of the dorsal and anal fins are arranged two rows of spiny scales, with their points directed backwards. In colour it is a brownish shade tinged with yellow; and each side is marked with a large black spot,

which tradition says are the prints of Peter's finger and thumb, when he took the tribute money from the mouth of the Dory. It is a warm-water fish, and consequently is little seen in the North Sea; but it is common in the Mediterranean, the English Channel, and in many ocean regions as far away as Australia and Japan. The ancients considered the Dory to be the king of table-fish, and, in fact, its flesh much resembles that of the turbot.

The typical Flat-fish is compressed sideways to the greatest possible extent, the dorsal and ventral fins extending along the body from the head to the tail. The right side of the fish is dark and slightly convex, the left side is white and flat, and it is a mistake to speak of the dark back and light belly. When the young fish is first hatched it is normally symmetrical, with an eye on each side of its head, and its jaws similar on the right and left sides. As the fish grows and develops more and more its compressed shape, the front part of the skull is gradually twisted, bringing the eye round from what is called the 'blind' side to the edge of the dark side. This modification is in strict accordance with the life habits of these fishes, which spend much of their time lying on their side on the sandy or muddy bottom of the sea, where they feed chiefly on molluscs, crustaceans, sea-worms, etc. In such a position an eye on the under side would be of no service. While at their ease, the Flat-fishes slide themselves over the bed of the sea, but if alarmed they dash off with astonishing speed, undulating through the water with serpentine ease and elegance. The generic name means a 'side swimmer.' Though varying in colour in different species, the upper or dark side bears so great a resemblance to the sea bottom, that they can scarcely be distinguished, even when the eyes are directed towards them.

The Plaice (*Pleuronectes platessa*) is light brown in colour, variegated with a number of bright red spots upon the body and the dorsal and anal fins. It is found all round the British coasts; formerly nine-tenths of our supply came from the southern portion of the North Sea, but, as before stated, our trawlers now go enormous distances for their catches. Over a million hundredweights of Plaice are landed at British ports during the year.

The Flounder (*P. flesus*) frequents the more brackish waters of estuaries. It is fairly common on our shores, but not to the same extent as on the opposite continental coasts, especially in the Zuyder Zee and the Baltic. It may be recognised by the dark mottlings, instead of red spots, on its brownish upper surface.

The Common Sole (*Solea vulgaris*), owing to the delicacy of its flesh, is one of the most highly esteemed of the flat-fishes. It frequents rather warmer waters than the plaice. Off the coasts of Devon and Cornwall, and from Grimsby to Lowestoft are our best fishing-grounds, and a good portion of our supply comes from off Spain and Portugal. An average fish weighs little more than a

pound, but a weight of 9 lbs. has been recorded. The Sand Sole (*S. lascaris*) is also called the Lemon Sole, but as often as not the Smear Dab (*Glyptocephalus microcephalus*) is sold under that name.

The Turbot (*Rhombus maximus*), one of the best of our food fishes, commonly scales from 5 to 10 lbs., but it often attains a length of three feet and a weight of 20 lbs. to 30 lbs., and in the less frequented fishing-grounds even much larger fish are taken.

The Halibut (*Hippoglossus vulgaris*), the largest member of the family, inhabits the deeper and colder waters off Norway, Iceland, Spitzbergen, Newfoundland, and Alaska. Our British supplies come mainly from around the Faröe Islands and Iceland. The size is very variable, ordinarily from three to five feet in length; a length of six feet and a weight of 120 lbs. are not rare, and even double that weight is not unknown.

MISCELLANEOUS FISHES

Among the host of remaining Teleostean fishes in the sub-order Acanthopterygii a few of the more striking must receive at least passing mention.

The Gobies (Family: Gobiidæ), of which there are many species, are well represented around our coasts, one of the commonest being the Black Goby (*Gobius niger*), often called the Rock-fish. A peculiarity of its structure rests in the pelvic fins, which are united to form a hollow disc, which becomes a sucker by means of which the fish attaches itself to rocks and stones. The adhesion is achieved with astonishing rapidity, and its hold is very tenacious. The Gobies have rather interesting breeding habits. The female affixes her eggs to the under side of stones or weeds, and the male



MUD-SKIPPER

fish attaches himself close to them, and guards them until they are hatched.

The Mud-Skipper, Walking-fish, or Jumping-fish (*Periophthalmus koelreuteri*) is a native of estuarine mud-flats in tropical Asia, Africa, and Australia. The appearance of the specimen in the photograph is very suggestive of a big tadpole with bulging eyes close together on the top of the head. The ability to walk is derived from the muscular development at the base of the pectoral fins, which converts them into useful feet for progression on mud, or even for climbing trees. Along the side of a river the Mud-Skipper may be seen "stationary, contemplating all passing objects, or else snapping at flies or other insects; suddenly, startled by something, away they go with a hop, skip, and a jump, either inland among the trees, or on to the water like a flat stone sent skimming by a schoolboy." In climbing stems, stalks, etc., they hold on by their pectoral fins as though they were arms. The Mud-Skipper, though undoubtedly a fish, will drown in deep water.

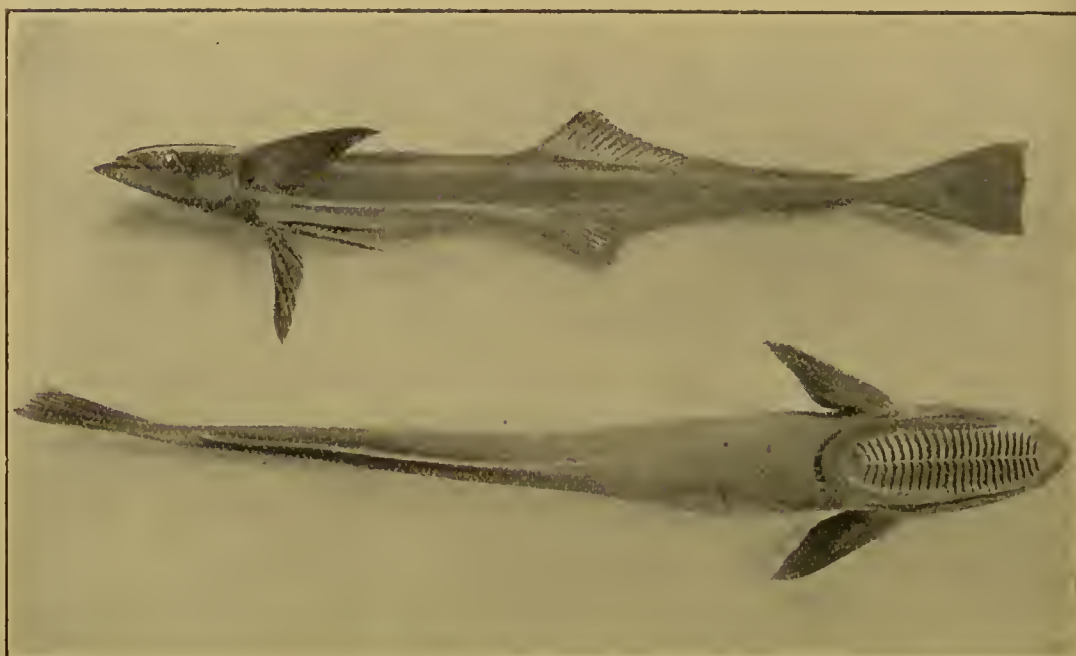
The Cottidæ family includes the Bull-Head, or Miller's Thumb (*Cottus gobio*), the chase of which affords great sport to juvenile fishermen, who rout it out of its hiding-place under loose stones. The name of Bull-Head refers to the width and flatness of the skull. The mouth is very wide, and contains numerous minute teeth which well serve the voracious little fish, when feeding on water-insects, worms, and the young fry of other fish. It seldom exceeds four or five inches in length. It is dark brown on the back, greyish white on the flanks, and white on the abdomen. The fins are marked with dark brown dots.

The Gurnards are quite as ugly as the last-named fish. Of the more than half-dozen species found on the British coasts the best-known is the Red Gurnard (*Trigla pini*), which grows to a length of over a foot. The upper parts are bright red in colour, under parts silvery white, and the fins reddish white. In another family are the Flying Gurnards of the Mediterranean Sea, and various tropical waters. Portions of their pectoral fins are developed into wing-like members by means of which they can move through the air. The rapid agitation of the Gurnard's wings, however, only carry it a few feet before it again drops into the water.

In the same division (*Triglifformes*) as the gurnards is the family Scorpænidæ, which includes several species of the Indo-Pacific tropical regions, of which the Red Fire-fish (*Pterois volitans*) is a notable example. In this remarkable fish the spines of the dorsal fin and the rays of the pectoral fins are developed to astonishing lengths. At one time this conformation was believed to confer upon its owner very marked flying powers, as evidenced in the specific name, which it still retains, although the ability to fly is entirely absent. The general colour of the fish is a light red, variegated with darker blotches on the body and spots on the tail and

fins. The prolonged spines and rays are marked with transverse bands, alternately lighter and darker red, giving to this extraordinary fish a really beautiful appearance.

The family Echeneidæ contains a small number of remarkable species, which are known as Sucking-fishes. The side view of one of these fishes (*Echeneis remora*) presents little out of the common, except its elongated form ; but upon the top of its head is a large oval sucker, which is a modification of the anterior dorsal fin. The fish is a poor swimmer, and it attaches itself to whales, sharks, turtles and boats, and is thus transported to different feeding grounds. When one of these fishes is captured and thrown into a boat, it



SUCKING-FISH

Photo H. Saville-Kent

affixes itself so closely to the wood, that it can only be removed by sliding the sucker forward. A smaller species (*E. naucrates*) is said to be utilised by some of the natives of the South Seas when turtle-fishing. When a turtle is descried, they throw into the water a Sucking-fish, to the tail of which is secured a long string. The fish immediately swims to the turtle, and affixes itself to the carapace. If it be a small turtle, the line is sufficient to draw it to the boat ; but if it is a large one, a native swims out and secures a rope to the captive.

Old writers firmly believed that one Remora was sufficient to arrest the swiftest ship in its course, and fix it firmly in the same spot in spite of spread canvas and swift gales. As the fish is only about the same size as a herring, no wonder that its marvellous powers caused poems to be written in its honour. In Macgillivray's

“Voyage of the Rattlesnake,” it was said that when the vessel was anchored off the Calvados Islands, the Sucking-fishes caused the sailors much annoyance by darting from under the ship’s bottom, and carrying off their baits and hooks. One fish was caught, and when it had been made fast to a billet of wood by a fathom or so of spun yarn, was again turned adrift. A shark, fourteen feet in length, attempted to seize the apparently helpless fish, but the Sucker with great dexterity fastened itself to its opponent’s back. Off darted the shark at full speed, the billet towing astern. The shark next got the billet in its mouth and, disengaging the Sucker by a tug on the line, made a bolt at it. But the puny Sucker was again too quick. It fixed itself close behind the shark’s dorsal fin, and defied all efforts to displace it, although the monster lashed the water with its tail until it foamed all around.

The Blenniidae family has numerous members, one of the most notable being the Wolf-fish (*Anarrhichas lupus*) which, on our shores, attains a length of five feet, but in northern waters is considerably larger. It is quite ferocious in appearance, its jaws, with an armature of terrible teeth, almost suggesting the tiger or hyæna. If netted with other fish, it will tear the net to pieces with its teeth; and when hauled out of the water, it bites at every object with the greatest ferocity, so that fishermen usually stun it before lifting it into a boat.

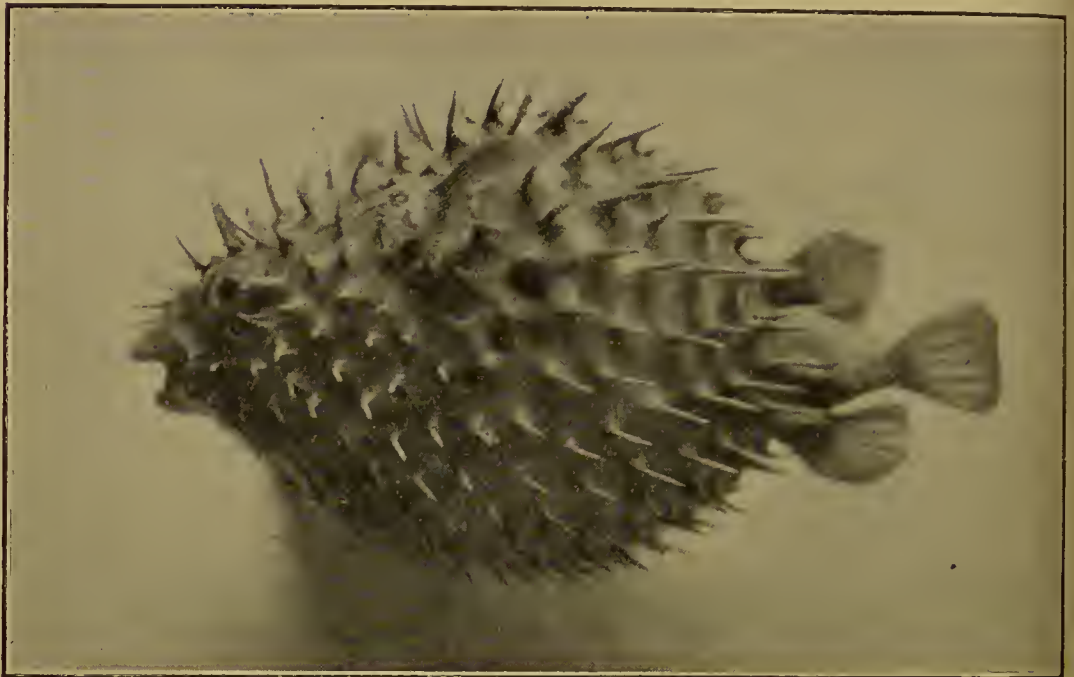
The Viviparous Blenny (*Zoarces viviparus*) belongs to an allied family, and is one of the few bony fishes that produce living young. There are from two to three hundred tiny fry at a birth; they are quite transparent, but are fully developed little fishes, and able to swim freely immediately upon their entrance into the world of waters.

In the family Trachinidae is the Greater Weever (*Trachinus draco*), no uncommon fish in French markets, for its flesh is of good flavour. British fishermen, however, often will have nothing to do with it, for its dorsal spines are not only capable of inflicting very painful wounds in themselves, but they give off a poisonous secretion. Though the poison is not particularly dangerous, the sensations for some time are decidedly unpleasant. Weevers intended for market are at once deprived of the dorsal spines. The name ‘Weever’ is doubtless derived from ‘wivere,’ the Anglo-Saxon for viper or serpent.

The Angler-fishes are distributed over all the oceans, but only one species (*Lophius piscatorius*) is found in British waters. It is also called the Fishing-Frog, and the Sea-Devil. It is impossible to mistake this fish for any other inhabitant of the ocean. It has a huge head—wide, flattened, and toad-like—its enormous, gaping mouth is fitted with rows of sharply pointed teeth, and its eyes are set on the top of the head, from which stand out three dangling

filaments, which are really developments of the first dorsal fin. These filaments have glittering tips, and are put to a remarkable use. Many fishes can be attracted by any glittering object moved gently in the water, and some species are best taken by metal baits. Inquisitive fishes quite naturally draw near to inspect the tips of the filaments dangling over the spot where the Angler is buried in the muddy sand, only to find themselves suddenly snapped up in the jaws of the hidden foe. The Adult Fishing-Frog is about a yard in length ; its general colour is brown above and white below.

The Globe-Fishes (Family: Diodontidæ) are strange creatures, which carry a tremendous array of spiny points on the skin of their



LESSER SPOTTED GLOBE-FISH

rather elongated cylindrical bodies. The great peculiarity of the fish is its power of swallowing air, and blowing itself out into globular form. When it assumes this balloon-like shape it becomes inverted, floating back downwards. It is perfectly helpless, and quite at the mercy of waves and currents ; but the distension of the body causes the spines to stand out like the quills of an irritated porcupine or a hedgehog, an armature that defies all foes. The voracious shark, however, will take warning from nothing, and sometimes swallows a Porcupine-fish or Sea Hedgehog, as it is also called. The experience does not necessarily distress the Globe-fish, while it may end disastrously for the would-be devourer ; for the presumed victim has been known to eat its way out through its captor's side. The Lesser Spotted Globe-fish (*Diodon maculatus*)

is a capital example of a family, all of whose members are found only in tropical seas.

The Star-gazers are members of the family Uranoscopidæ. The Common Star-gazer (*Uranoscopus scaber*) is a Mediterranean species. Its head is broad, and upon its upper surface the eyes are set, looking upward as though engaged in contemplating the stars, for which reason the ancient Greeks called it the Holy, or Heavenward-looking, Fish. It is not a rapid swimmer, and consequently has to resort to artifice to obtain much of its food. Like the fishing-frog, it buries itself in the mud or sand, hiding all but its eyes and mouth, from which latter projects a delicate filament, with which the creature deliberately angles for prey. A small fish that ventures to snap at the tempting bait is sure to fall a victim to the hungry mouth that suddenly appears from beneath the sand.

The writer realises how impossible it is to present a really satisfactory review of some ten thousand species of fishes within the limits of forty pages. Only a few of the better-known species have been described. Tropical waters, in particular, teem with fishes of innumerable shapes and of brilliant coloration that outvies the gaudiest-plumaged birds of the adjacent land regions. Let the average reader count the species of fish of which he has partaken, and put the result alongside the fact that in Eastern markets two hundred different species of fish are often on sale at once.

The products of the sea form one of the standing food resources of civilised and uncivilised man. In many regions the land food products only as the result of organised labour; the seed must be sown and the crop harvested and stored for use during the period when the soil ceases to be productive. But Nature alone sows the ocean, and the fishermen can reap a continual harvest. Sir James Crichton-Browne maintains that in our fish-begirt islands we regard the finny tribes too little as a staple article of diet, and that we might avail ourselves more fully of the larder of the deep. At one time fish had a much greater vogue in this country, and the majority of the people were not only in the habit of eating fish on one or two days in the week, but confined themselves wholly to it during Lent. Notwithstanding increased facilities for catching and distribution, it is a fact that the consumption of fresh fish has by no means kept pace with the increase in population. Taste, fashion, and prejudice regulate the market, and some fishes, such as hake, sprats, and conger eel, which are highly nutritive, as well as cheap, have fallen into comparative disrepute. It is lamentable to reflect that while many of our people go short of food, enormous quantities of wholesome, nourishing fish are thrown back into the sea or converted into manure because it does not pay to bring it to market. Experts declare that if there were a greatly increased

consumption of fish, the seas within fishing distance of the British Isles could provide sufficient stores of the coarse and cheaper species, such as ling, haddock, skate, mackerel, codlings, sprats, and herrings, for their great fecundity renders the supply practically illimitable.

There are several very fish-like creatures which modern scientists now refer to distinct classes. In the class Cyclostomi is the Lamprey (*Petromyzon marinus*), which is a marine fish that ascends rivers for the purpose of spawning. Its naked body is serpentine in shape, except for two long, low, dorsal fins, the hinder of which runs into the caudal fin. Its chief peculiarity, however, is the lack of a hinged lower jaw, the mouth being developed into a circular, leech-like sucker, furnished with numerous horny teeth. The word 'Cyclostomi' means "round mouth." The Lamprey does not eat in the same manner as an ordinarily-jawed fish. It affixes itself to a living fish, such as a cod, haddock, mackerel, or salmon, and rasps off flesh until its hunger is satisfied. If the meal is a prolonged one the victim generally dies of its wound. Notwithstanding its name, the River Lamprey (*P. fluviatilis*) is also caught in the sea. At one time it was particularly abundant in English rivers, and its flesh was in high repute. It is of historic interest that Henry I died after partaking too heartily of a dish of Lampreys.

The Common Hag-fish (*Myxine glutinosa*) is one of several marine species that are totally blind, and are often found at great depths. It feeds upon the flesh of fish, and often contrives to bore its way into the body of a cod, sometimes entering into the abdominal cavity.

INVERTEBRATES

.

INVERTEBRATA

THE INVERTEBRATE ANIMALS

THE animal world is divided commonly into two great sections, the Vertebrata and the Invertebrata. In the Backboned Animals the vertebral column is a development of a primitive structure that is known as the notochord, which is permanent throughout life in various creatures that, while not true Vertebrates, are yet a step higher in the evolutionary scale than the typical Invertebrates. In the modern system of classification these creatures are added to the true Vertebrates to form the Chordata, while all the remaining lower forms of life are termed the Invertebrata. The latter term, however, cannot be viewed as a really satisfactory title for the animals that are outside the Chordata, being based upon a negative, instead of upon a positive, principle. Nevertheless it is intelligible, and convenience and usage still permit its use.

Invertebrate animals possess neither skull nor backbone; the blood is colourless; the jaws always move horizontally. They air their blood through holes in their sides, slits in their necks, or through their tails; not a single Invertebrate uses its mouth in breathing. With the exception of some of the amphibians, all young vertebrates are born in the form of their parents; they grow bigger, but do not change their general outline. Young Invertebrates rarely resemble their parents in the early stages of existence, and the insects in particular undergo remarkable metamorphoses.

The Non-Chordate animals are divided into an enormous number of species, and in the multitude of their individuals far surpass the members of the preceding classes of Chordates. In the few remaining pages it is manifestly impossible to give a detailed account of the Invertebrates. The most that can be attempted is to present a general outline of each sub-kingdom, to describe some typical forms in each, reserving for fuller treatment a few of those that are most singular or beautiful, interesting in habits, or directly useful to man.

The Invertebrates are divided into sub-kingdoms, comprising various classes, which contain a large number of orders and sub-orders, of which only the most important will be mentioned specifically.

SUB-KINGDOM : MOLLUSCA

THE SOFT-BODIED ANIMALS

Viewed from an economic standpoint, the Molluscs, because they include the shell-fish, form the most important sub-kingdom. The body, soft and fleshy, is enclosed in a muscular sac which is called the 'mantle.' Some of them are naked and defenceless, but in the majority of cases they are protected by a hardened shell which is formed from the tissues of the body, thus being a real part of the animal. Of the more than fifty thousand known species, more than two-thirds are marine creatures, and the dredging of the ocean depths constantly brings new forms to light ; many species inhabit fresh water, and others are terrestrial. The shells are of two kinds : those which are in a single piece, as in the snail and periwinkle, are called univalves ; those which consist of two plates, hinged, are called bivalves. The removal of the shell, which is an admixture of carbonate of lime and a little animal matter, generally entails death, and though some Molluscs are able to repair an injury to their covering, no species, if deprived of it, can produce another shell. Many shells are delicately coloured, others are gorgeously variegated in tint, and not a few are extremely eccentric in shape. In size some of the Mollusca are quite microscopic, while others attain a weight of half a ton.

The power of progression in the Molluscs is very varied ; in some species it is absent altogether ; in others it is wonderfully developed. Some creatures, such as the mussel, limpet, etc., scarcely stir from the spot where they once fix their habitation ; the snail, and those of similar form, glide slowly along by means of the curiously developed mass of muscular fibres, which form a broad, fleshy foot, and other species move by different methods that will be described in later pages.

The Mollusca are divided into various classes, of which the chief are :

- Cephalopoda, or Head-footed molluscs ;
- Gastropoda, Univalves, or Stomach-footed molluscs ;
- Pelecypoda, or Bivalve shell-fish.

THE CEPHALODS

The title Cephalopoda is derived from two Greek words signifying 'a head' and 'a foot,' and is applied to the following creatures because the feet, or arms as they might also be called, are arranged in a circular manner round the mouth. These tentacles are fur-

nished with rows of hollow discs, each of which is a powerful sucker that can retain its hold with wonderful tenacity. The limbs are also used as legs, enabling the creature to crawl on the ground. Only the nautilus has an external shell, but most of the other cephalods have at least a calcareous plate embedded in the mantle. There are two sub-orders, namely, the Octopoda, or eight-footed creatures, of which the Octopus (Family: Octopodidæ) and Nautilus (Family: Argonautidæ) are examples; and the Decapoda, or ten-footed creatures, such as the Squid (Family: Loliginidæ) and Cuttle-fish (Family: Sepiidæ).

The Common Octopus (*Octopus vulgaris*), though sufficiently hideous in form and obnoxious in character, is not the gigantic creature that the fictional writer sometimes describes with a wealth of detail. A body of the size of a football, with tentacles from four to five feet long and as thick as a man's wrist, with a total weight of from 200 to 300 lbs., may be accepted as about the limit of size. An Octopus of these dimensions, with its tentacles outspread, would cover a circular area ten feet in diameter. One of these large creatures, Devil-fish it is sometimes called, is quite capable of seizing a man and drowning him, for the most powerful swimmer, if unarmed, could not disengage himself from the five or six score of suckers on the loathsome entwining arms. Its body is sombre brown in colour; its eyes are large, and appear to gleam with implacable hatred of every living creature. Under the head is a remarkable apparatus, a membranous tube, which is connected with the gill cavity. This funnel, or siphon, is an additional locomotive organ. Normally, the siphon, without any apparent effort, ejects the water that has passed over the gills; but specially violent expulsions give rise to a motive force, always propelling the Octopus backwards, but in varying directions, according to whether the aperture is turned to the right or left. Through this funnel the animal can also discharge an inky-black fluid for discolouring the water, under cover of which the cephalod can escape from an enemy.

The Argonaut (*Argonauta argo*) is so called in allusion to the *Argo* and her golden freight. It is a pretty fable that this cephalod floats on the surface of the sea in fine weather, holding out its two longest arms like sails in the breeze; whereas to assist progress it only uses them in oar-fashion. As a matter of fact the creature is rarely on the surface, except as a result of storms, for the Argonaut's natural habitat is the sea-bottom. Only the female has a shell, in which her eggs are incubated and her young ones cradled. Another name, Paper Nautilus, refers to the extreme thinness and fragility of the shell. The shell-less male is practically an octopus in miniature.

The Squids are not dwellers in shallow waters and rock crevices, like the octopus, but prefer the open sea, where the smaller ones are preyed upon by fishes and sea-birds, and the larger ones by

the cetaceans. The Common Squid (*Loligo vulgaris*) is of very frequent occurrence on our coasts, and is often used by our fishermen for bait. In some parts of the world are Squids of enormous size, ranging from thirty to fifty feet in length, and weighing about 1000 lbs.



Photo

W. Saville-Kent

SQUID, OR CUTTLE-FISH

Although the term Cuttlefish is often indifferently applied to the octopus and squid, it rightly belongs to the family Sepiidae, the members of which are generally not more than eighteen inches in length. The best known is the Common Cuttle-fish (*Sepia officinalis*). The ink-bag of the Cuttle yields the valuable colour called sepia. The creature can eject the ink with such force that a naval officer's white duck trousers have suffered from the liquid missile, and the aggrieved individual could not be persuaded that the Cuttle did not deliberately aim at him with malice aforethought.

All of the Cephalods are used as food in different parts of the world. Mrs. Bras-

sey says that in the fish markets of Japan, a real octopus in a basket, with its hideous body in the centre, and its eight arms arranged in the form of a star, is worth from a dollar to a dollar and a half, according to size. In some of the Mediterranean countries squids are dried and stored away for use, either boiled or fried, as occasion requires.

THE GASTROPODS

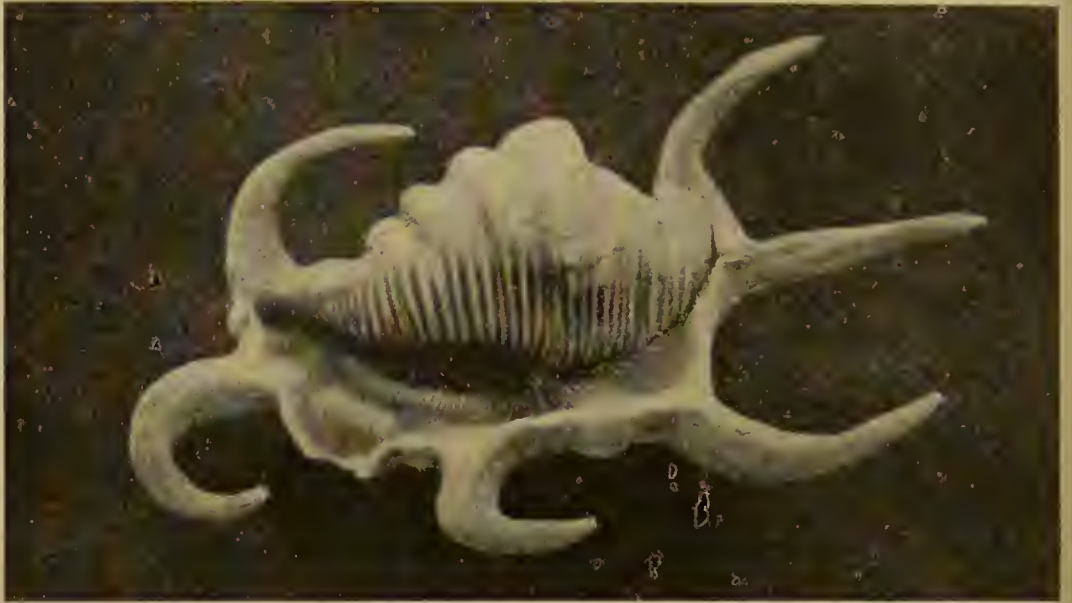
The Gastropods form an enormously large order, for they comprise the snails, whether terrestrial, aquatic or marine, the whelks, limpets, etc. The shells vary in shape ; the majority are external and spirally twisted, but some are tubular, or conical ; some of the creatures have internal shells, and others have no shell of any kind. Many of the shells exhibit the most brilliant coloration, and are employed in the manufacture of beautiful cameos. In size they range from those of quite minute proportions to those that can be used as signal horns, for baling out boats, or as water vessels generally. The Gastropods are nearly all crawlers, making progress by the expansion or contraction of the muscular foot. The head is usually more or less distinct. The teeth are very variable in form, and still more in number ; some species have thousands of minute teeth, set chiefly on the tongue, not for biting, but for rasping even hard substances. One structure belonging to most of these creatures must not go unnoticed, viz., the 'operculum,' which closes the aperture of the shell when its owner is withdrawn into the recesses of its home. An examination of the water-snail will show that the operculum is composed of a horny substance, thicker and heavier than any other portion of the mantle.

The Whelk (*Buccinum undatum*) is one of the most carnivorous of the molluscs. Its long tongue, armed with row upon row of curved and sharp-edged teeth, harder than the notches of a file and keen as the edges of a lancet, is a most irresistible instrument when rightly applied, drilling a circular hole through the thickest shells as easily as a carpenter's centre-bit works its way through a deal board. Vast quantities of Whelks are taken in large wicker baskets, which are baited with the refuse portions of fish and lowered to the bottom of the sea by ropes. The eggs of the Whelk are little yellowish capsules, each of which contains several minute shells. When the young are hatched the capsule splits at one end, so as to allow the escape of the tiny creatures.

The Periwinkle (*Littorina littorea*) belongs to a family of shore molluscs that frequent the coasts and feed upon various algæ, scraping away the vegetable matter with a formidable series of sharp teeth.

Numerous shells, such as cones, volutes, harp-shells, olives, and mitres always figure largely in the collections of conchologists, their shapes being indicated by their names. The Scorpion-shell (*Pteroceras aurantias*) is creamy white on the exterior and rich orange within. The curved spines are white and shiny. This gastropod is not a crawler, but a hopper, to assist which the foot is particularly muscular. The Cowry (*Cyprea moneta*), yellowish or white in colour, with grooved or wrinkled edges of the lip, is of

far greater importance than its small size and ordinary coloration would suggest. In many parts of Africa and India these shells take the place of current coin. They are collected in the Eastern and Polynesian seas, and in a single year sixty tons of shells have been forwarded from one British port to West Africa.



SCORPION-SHELL

There are several families of Limpets, chiefly distinguished from each other only by differences in the shell. All of them are strongly adhesive, as will be seen by anyone who tries to remove a common Limpet (*Patella vulgaris*) from the stony surface to which it clings. Its method of attachment is analogous to the mode in which the suckers of the cuttle-fish adhere to the objects which they seize. The foot of the Limpet is rounded, broad, thick, and powerful. When the animal wishes to cling tightly to any substance, it presses the foot firmly upon the surface and retracts its centre, while its edges remain affixed to the rock. A partial vacuum is therefore formed, and the creature adheres as firmly as a boy's sucker to the stone on which he has pressed it.

The Gasteropods of the land breathe atmospheric air, and are furnished with respiratory organs suited to the element in which they live. The Common Snail (*Helix aspersa*) is one of fourteen or fifteen hundred, more or less, similar species, among which is the Edible Snail (*H. pomatia*). The taste for eating snails certainly dates back as far as the ancient Romans, and in various European countries these molluscs, roasted or pickled, still form an attractive dish. Their slimy, slippery forms cause us to view them with repulsion, but there is no doubt that they are possessed of marked nutritive qualities. In the markets of Paris are often sold four tons of Snails a day, most of which come from the gardens of Poitou,

Burgundy, Provence, etc., where they are specially reared and fed upon aromatic herbs to improve the flavour of the flesh. The market price of the best Snails is about three francs fifty cents per hundred.

In many parts of the world are found Snails of far greater dimensions than any with which we are familiar. In the latter part of the year 1910 some of the coast regions of Ceylon suffered from a plague of these molluscs, many of which attained a weight of one pound. They attacked the young cocoanut trees, and as the rubber plantations were threatened, the Government had to take measures to check the devastation. A notable example of these larger gastropods is the Giant Snail (*Achatina fulva*) of East Africa and the Mauritius and Seychelle Islands, which is only one of various similar species; it lays eggs as large as those of a pigeon. The penny by the side of the specimen in the photograph enables one to gauge the actual size of this monster



GIANT SNAIL
(Less than half life-size)

Snail, which is over eight inches in length from the tips of its horns to the spiral tip of the handsome shell.

The Common Pond Snail (*Limnæa stagnalis*) is typical of numerous freshwater species. In all the members of the several families the shell is thin, and sufficiently capacious to contain the entire animal when it desires to withdraw itself into its home. The aperture is simply rounded, and the lip is sharp. It may be found in abundance in nearly all streams where the water is not polluted, and the current not very swift.

THE BIVALVES

Among the Bivalves are a large number of species that are used as food all the world over, of which we may notice oysters, mussels, cockles, scallops, and clams.

The Edible Mussel (*Mytilus edulis*) is abundant on most of our coasts, mooring itself to rocks, stones, and fibres, alternately covered with water, or left dry according to the tide. The common Cockle (*Cardium edule*) is a marine creature, but with a liking for brackish water. It is to be found chiefly about low-water mark, where it buries itself in the sand by means of its powerful foot, which also enables it to leap to a surprising height.

The Pearl Oyster (*Meleagrina margaritifera*) is a native of the Eastern seas. The pearls are secreted by the animal in exactly the same manner as the nacre of the shell, except that the substance is formed into a globular shape, and disposed in concentric layers that cause the peculiar translucency which jewellers term 'water.' The principal pearl fisheries are in the Persian Gulf, Ceylon, various Malayan islands, and on some of the coasts of China and Japan; in America the best fisheries are in the Gulf of Mexico and off the coasts of New Spain, Columbia and Guiana. Mother-of-pearl, used for inlaid work, fancy knife-handles, etc., is the iridescent inner coating of various species of large Oysters which are found chiefly in the East, from the Gulf of Persia to Australia. The Oysters usually are obtained by men specially trained to remain under water for a considerable time. Each diver takes with him a net bag for the purpose of holding the shells, puts his foot into a stirrup from which hangs a heavy stone, and after taking a long breath is carried swiftly to the bottom. He flings himself on his face, fills his bag hurriedly, and when his breath begins to fail, shakes his rope as a signal, and is drawn up together with his bag. In some cases properly equipped divers are employed, who can leisurely select the best shells, and at the same time outwit the sharks that constantly attack naked men.

The Scallop (*Pecten maximus*) is considered a great delicacy. Its body is bright orange or scarlet in colour; the mantle is generally a shade of fawn with brown marblings. It makes fair progress through the water by flapping its opposing shells. The shell of another species (*P. jacobæus*) was termed St. James's Shell. Pilgrims to the Holy Land were in the habit of wearing it, and it became the badge of various orders of knighthood.

In the family (Ostreidæ) is the familiar Oyster (*Ostrea edulis*), which is common in most seas, although those on some parts of the British coasts are esteemed more than all others. So great is the demand for this mollusc that vast beds of them are cultivated with the greatest care; Colchester and Whitstable are our most famous fisheries. Young oysters are conveyed to artificial beds,

where they are fattened and are called 'natives.' The young bivalves are laid in regular rows, and are ready at all times to be taken from the bed and sent to market. 'Natives' thus artificially cultivated are finer and fatter than those which grow in the open sea, but their extra size does not atone for their comparative lack of flavour. Oysters may not be sold from May to August, that being the period when they cast their 'spat' or spawn. The Oyster fisheries of the United States and Canada, France and Holland are very large, and great quantities, either fresh or tinned, are exported to Britain.

The Giant Clam (*Tridacna gigas*) is the largest of all the bivalves. In the tropical seas of Australia, in particular, are found whole colonies of enormous clams, such as are seen in the photograph. In the foreground is a specimen measuring four feet in diameter and weighing several hundred pounds. Several species are found on the British coasts, but they are seldom eaten; various rather large forms are sold in the fish markets of the Atlantic States of North America.

A near relation to the preceding molluscs is the Teredo, or Ship-worm (*Teredo navalis*). It is common in most seas, and on our coasts works enormous mischief by eating into all kinds of submerged woodwork, the bottoms of wooden ships, etc. The burrow which the creature forms is usually half an inch in diameter and partially lined with shell.



Photo

W. Saville-Kent

GREAT CLAM-SHELL ON A CORAL REEF

SUB-KINGDOM : ARTHROPODA

CLASS : INSECTA

THE INSECTS

Insects, of which there are more than a quarter of a million known species, are small creatures whose bodies are divided into three parts, namely, the head, thorax, or chest, and the abdomen. Each of these consists of a number of rings; one forms the head, there are generally three in the thorax, and from nine to sixteen in the abdomen. These ringed segments form one of the distinctive marks of the class. Though the segments are hard, or horny, for protection, they also permit great flexibility of movement. The head is in one piece, in which are the eyes and mouth, and from which project two antennæ, or feelers. No insect possesses a brain, and the nervous system consists of knots of matter, the largest of which is placed in the head. The form of the mouth varies; in the beetles, for example, it consists of an upper and lower lip, between which are two pairs of jaws, one for biting, and the other for chewing, and in the flies the jaws are replaced by a proboscis or trunk for sucking juices. To the thorax are affixed three pairs of jointed legs below, and generally two pairs of wings above; but some species have only one pair of wings, and in a few instances they are absent altogether. Most of the Insects undergo very marked metamorphoses as they grow to maturity. From the egg is produced the larva or grub, which develops into the pupa or chrysalis, and this in turn changes into the imago or perfect insect. The larvæ of butterflies are termed caterpillars, those of beetles are called grubs, and those of flies are maggots. It is the hungry larvæ that work such havoc to crops, etc. The whole of the growth takes place in the preliminary stages, so that the perfect insect never grows, and the popular idea that a little insect is necessarily a young one is quite incorrect.

Insects breathe in a very curious manner. They have no lungs nor gills, but their whole body is permeated with a network of tubes, through which the air is conveyed, and by means of which the blood is brought into contact with the vivifying influence of the atmosphere. These breathing tubes, technically called tracheæ, ramify to every portion of the creature, and penetrate to the extremities of the limbs, the antennæ, and even the wings. Their external orifices are called spiracles, and are set along the sides. Many other interesting structural features of the Insects will be described in the following pages in connection with various species.

ORDER : ORTHOPTERA

THE STRAIGHT-WINGED INSECTS

The name of this order is derived from the Greek, *orthos* (straight) and *pteron* (a wing), but it comprises some species that never have wings. Among its members are some of the finest, and at the same time some of the most grotesquely formed, specimens of the whole class Insecta. The fore-wings are usually of leathery consistency, and beneath them are folded the wider, membranous, fan-shaped flying wings. In some species the metamorphosis is less perfect than in the majority of insects, the young exhibiting at least some resemblance to the parent when it emerges from the egg. For example, in the pupa of the earwig the tail forceps are visible, and there is no real inactive stage, the changes being effected by a series of moults.

The chief families in the order Orthoptera are the Earwigs (Forficulidæ), Cockroaches (Blattidæ), Mantids (Mantidæ), Leaf and Stick-insects (Phasmidæ), Crickets (Gryllidæ), and Locusts and Grasshoppers (Locustidæ). In the last three families the hind legs are specially developed for leaping, instead of running and walking.

The Common Earwig (*Forficula auricularia*) is typical of many hundreds of species, in all of which one of the chief characteristics is the pair of forceps at the end of the body. Its pair of membranous wings, thin and delicate to a degree, are very large and rounded, and yet capable of being packed in the most admirable manner under the little square fore-wings, which technically are termed the elytra. The process of packing is greatly assisted by the forceps of the tail, which work as deftly as though they were fingers. All Earwigs do not possess wings, but those that are furnished with them generally fly by night ; during the day they hide in crevices, under decaying vegetable matter, or in large-headed flowers. The female is said to brood over her young like a hen over her chicks, which is a very unusual method among the insects. The habit suggested by the name 'Earwig' is denied by many writers, who would substitute 'earwing,' in reference to the shape of the wings. It is, however, no unusual thing for medical men to have to remove these insects from the human ear ; but the invader cannot penetrate to the brain, as asserted in old wives' fables ; it can give rise to no more harm than discomfort, and a spot of olive-oil will cause it to make a speedy exit.

The Cockroach (*Periplaneta orientalis*) is often erroneously given the name of black-beetle, whereas its colour is a dirty red. It is supposed to have been brought originally from India. The legs are densely spined. The female is broader in the body than the male, and is without wings ; but there are some species in which both

sexes are wingless. The eggs of this insect are not laid separately, but about sixteen of them are enclosed in a hard, membranous case, the edges of which are toothed. When the young are hatched, they pour out a fluid that dissolves the cement which holds the edges of the capsule together, the receptacle closing again when the young ones have escaped. Thus it is that the empty capsules, found under planks and boards, always appear to be perfectly entire. In the tropics Cockroaches attain much larger dimensions than in colder climates. The American Cockroach (*P. americana*), three inches in length, quite commonly infests ships, and is often found in the dock buildings of British seaport towns.



LEAF-INSECT

The Mantids are carnivorous insects that are found in the south of Europe, and in many tropical regions. The best-known is the European Praying Mantis, or Soothsayer (*Mantis religiosa*). In common with all the various species, it stands on its two pairs of hinder legs, while it holds up the front pair close together, as if in an attitude of prayer. It was once popularly supposed that the creature would direct a lost person on his road, by stretching out one of its arms and pointing in the proper direction. The Mantis, however, is as voracious as a wolf and as combative as a gamecock. If a fly or other insect come within reach, its front legs dart out and seize

the prey, which is held tightly by the spines with which the tibia and femur are armed. Two Mantids of the same sex will fight with dauntless courage, striking with their fore-legs so forcibly as sometimes to sever the body of an antagonist.

Protective resemblance is met with in all classes of animal life, but not to the same extent as among the insects. The Leaf- and Stick-insects are chiefly interesting on account of their wonderful resemblance to portions of the vegetable kingdom; some assume the forms of broken twigs with such fidelity that even the practised eye is often deceived; and others take not only the flat outline and half curl of fallen leaves, but even reproduce the soft vegetable shades of colour with marvellous exactness. The accompanying excellent photographs will repay careful inspection, exhibiting the natural imitiveness far better than any written description. The Leaf-insect (*Pulchruphyllium geloneus*) is a species from the Seychelle Islands. The Stick-insect (*Bacillus rossi*) is a native of Southern Europe, and five specimens are shown attached to one small spray.



FIVE STICK-INSECTS ON A SPRAY

We now come to the jumping species of Orthoptera, of which the familiar House Cricket (*Gryllus domesticus*) is very familiar. The Field Cricket (*G. campestris*) is a noisy creature that makes hedges and old walls in country lanes vocal with its curious chirp, if such a term may be applied to a sound which is produced by rubbing one wing over the other. The slightest noise will cause the insect to retreat to the deepest recesses of its burrow. Never-

theless, it is pugnacious to no slight degree. If a blade of grass be pushed into its hole it will seize it and hold on so firmly that it can be drawn out into the light before it will loosen its hold ; and two specimens confined in a box will fight until one is killed to form a meal for the victor.

The Mole Cricket (*Gryllotalpa vulgaris*) is quite mole-like in aspect and burrowing in habit. In colour it is brown of various tints ; the thorax in particular is covered with fine and short down. Its forelimbs are of enormous comparative size, and possess sufficient muscular power to enable it to burrow with remarkable rapidity. Its usual excavation consists of a central chamber from which radiate many winding passages. The female is provided with a long ovipositor ; she lays several hundreds of dusky yellow eggs. Usually the food of the Mole Cricket is of a vegetable nature, to which it adds other insects, and, under pressure of hunger, will eat even its own species.

The Common Grasshopper (*Stenobothris bicolor*) is usually found on sea-banks. It varies in colour, being green, or brown, or yellowish. The Green Grasshopper (*S. viridulus*) chiefly seeks inland grassy banks. The chirping of all the numerous species is produced by rubbing the femur and the wing together, and not by the wings alone, as in the crickets. The Grasshopper is commonly viewed as being perfectly harmless in our country, but swarms of the creatures are capable of working immense damage. At Saintes-Maries, a village in the south of France with only a few hundreds of inhabitants, the people once collected one thousand five hundred corn sacks full of insects, and at another time they gathered 8000 lbs. of eggs that would otherwise have developed into three hundred and twenty millions of insects.

The Migratory Locust (*Pachytylus migratorius*) may be described as a big grasshopper, whose jaws are so powerful, and voracity so



MIGRATORY LOCUST

insatiable, and numbers often so countless, that they destroy every vestige of vegetation wherever they pass, devastating a country as though a fire had swept over it. Vast armies of these insects in flight darken the sky as if by black thunder-clouds. Woe to the spot where they settle, for they consume everything that their jaws can sever, eating not only vegetation, but household linen, blankets, etc. As the myriad jaws are plied, the peculiar sound produced by the champing of grass, leaves, and twigs can be heard at a considerable distance. The Arabs, and various African races, utilise Locusts for food, roasting them in butter, or grinding them into powder and baking them into cakes. Livingstone spoke highly of the insect food, thinking it superior to shrimps; but it is said that the natives who eat Locusts largely are never long-lived, the insect diet conducing to irresistible disease.

ORDER: NEUROPTERA

THE NERVE-WINGED INSECTS

The order Neuroptera contains several groups that some naturalists prefer to include in the foregoing order. The members are distinguished by the possession of four equal-sized membranous wings. The females are not provided with a sting or valved ovipositor. The chief families are the Dragon-Flies (*Libellulidæ*), May-Flies (*Ephemeridæ*), Lace-wing Flies (*Chrysopidæ*), Ant-Lions (*Myrmeleonidæ*), and the Termites, or White Ants (*Termitidæ*).

The Dragon-Flies are commonly known by the name of Horse-stingers, a singular misnomer, since they possess no sting and never interfere with horses. The title Dragon-fly, however, is perfectly appropriate, for they are more active and voracious in their own sphere than ever were the fabled dragons of antiquity. They form one of the most interesting groups of insects, for although they commence life in the water they end it in the air, with their bodies of various metallic hues and their brilliant glittering wings. The larval and pupal stages are spent in water, where the creature remains for ten or eleven months. Even the larva is predatory, grubbing about the bottom and devouring various living creatures with which it comes in contact. Its labium, or underlip, which covers the mouth from beneath, is extraordinarily long, and can be shot out rapidly to a distance of almost an inch to seize its prey by means of toothed appendages. The pupa is still more active, since it can propel itself through the water by means almost analogous to the apparatus of the nautilus. When its time has arrived, the pupa leaves the water and crawls up the stem of some aquatic plant. After a violent agitation, the skin of the back splits along the middle, and the Dragon-fly protrudes its head and part of the thorax. By degrees it withdraws itself from the empty skin, and rests for a few hours drying itself, and shaking out the innumerable

folds into which the wide, gauzy wings have been gathered. After much waving, the glittering membranes gain strength and elasticity, and the full-fledged insect launches forth into the air in search of prey and a mate.

It is often popularly believed that the life of the May-fly is restricted to a single day. It is true that twenty-four hours may witness its entrance into the perfect state and its final exit from the world, but at least two years have been spent in preliminary stages in the water. Of about fifty species the best known is the common May-fly (*Ephemera vulgata*). Its body is from a half to three-quarters of an inch in length, and it is furnished with three very long thread-like tails. It is wrong to suppose that this insect only appears in May, for various species are to be seen on any fine day in summer and autumn, except during the hottest hours, when they seek repose under shelter. Sometimes May-flies occur in countless myriads, looking like a heavy fall of snow as they are borne by the breeze.

The Lace-Wing Flies are beautiful and delicate insects. One species is named the Golden-eyed Fly (*Chrysopa vulgaris*) on account of the extreme brilliancy of the large projecting eyes, which give forth flashes of gold and ruby light. There is one drawback to the beauty of these insects; when handled, they give off an indescribably disagreeable odour. The female sometimes deposits her eggs in groups on leaves, etc. At other times she commences operations by drawing a fine viscous thread between two leaves or twigs. Along the thread she sets from a dozen to fifteen eggs; and the footstalks are so firm that they hold their burden in a nearly upright attitude. The larva feeds upon aphides, etc., from which it drains all moisture. It ends its first stage of existence by spinning a silken cocoon in which to develop the pupal state.

The Ant-Lion (*Myrmeleon formicarius*) in its perfect form is light and elegant, and much resembles a dragon-fly. In its larval condition it looks rather like a flattened, large-jawed maggot, furnished with long legs that are of little or no service for progression, all movements being made chiefly by means of the abdomen. Though it is slow in motion, the larva is extremely predaceous, and obtains its food in a particularly interesting manner. Living chiefly in loose sand it digs a conical pit, at the bottom of which it lies in concealment until an ant or other soft-bodied insect falls into the trap to be seized and killed. When the captive is sucked dry of its juices, the shrivelled skin is thrown outside the pit, and the larva settles down to await another victim. Sometimes the snared insect escapes the first onslaught of the eager mandibles and attempts to scramble out of the enclosure, but the Ant-Lion immediately throws up sand with its head, which causes the prey to fall once more to the bottom into the clutches of the ingenious larva.

The Termites, or White Ants, in most of their habits greatly

resemble the true ants. They are miners, and many of them erect edifices of really vast dimensions, considering the size of the architects and builders. The Common White Ant (*Termes bellicosus*) often raises mounds sixteen or seventeen feet in height; the dwelling consists of clay and is of astonishing hardness, although it is hollow and pierced by numerous galleries. A full-sized and complete habitation usually takes the form of an irregular cone, covered



Photo W. Saville-Kent

TERMITES' NEST

with turrets and smaller cones, such as are shown in the photograph. The great majority of the Termites in a colony are the 'workers,' or neuters of both sexes, whose chief duty is to build and tunnel. A small proportion of the inhabitants are the 'soldiers,' whose office it is to defend the community in general, for which their bigger heads and stronger mandibles specially fit them. They are born radiators, biting fiercely and holding on with such tenacity that it is necessary to pull them to pieces before they will loosen their grip. In a special chamber are the king and queen, surrounded

by walls that are pierced by holes too small to allow the royal couple to escape, but large enough for the workers to pass in and out with food and to remove the eggs laid by the queen to other chambers, where they are hatched and the young larvæ fed on comminuted dead wood mixed with saliva. The queen Termite deposits eggs at the rate of several thousands a day, and will continue the process for months at a time. There are many species of Termite, and all are fearfully destructive pests in the regions where they reside. Nothing, unless cased in metal, can resist their jaws, and they have been known to destroy the whole woodwork of a house in a single season. They always work in darkness, so that their destructive labours are often completed before the least intimation of their energy has been given. They will bore through the boards of a floor, drive their tunnels up the legs of the tables and chairs, and consume everything but a mere shell no thicker than paper, and yet leave everything apparently in a perfect condition. In some cases the Termite lines its galleries with clay, which soon becomes as hard as stone; for example, it has been found that a row of wooden columns in front of a house have been converted into stone pillars by these insects. In some parts of the world Termites exist in incredible numbers. It is calculated that two-thirds of the Island of Ceylon is undermined by these insects. Fortunately they have to run the gauntlet of hosts of enemies. Birds, bats, rats, and reptiles flock to the feast, and even man does not disdain to use them as food, for the Tamil coolie views a mess of fried Termites as a great treat.

ORDER: LEPIDOPTERA

THE BUTTERFLIES AND MOTHS

This immense order contains the most beautiful of all the insects. The technical term *Lepidoptera* means 'scale-winged,' and is applied to the Butterflies and Moths because their bodies and wings are covered with feather-like scales. The wings are four in number, and in some instances the two pairs are connected together by a strong bristle in one and a hook-like appendage in the other, so that the two wings of each side practically become one member. In the perfect insect the head is free; the mouth is developed into a tube or proboscis for taking nourishment by suction. Butterflies and Moths undergo very complete metamorphosis. The larva is called a caterpillar, and the pupa a chrysalis. The series of changes generally are better known than those of any other order, on account of the larger dimensions and more conspicuous habits of the insects. Space will only permit a description of about a dozen species.

The *Lepidoptera* are divided into two sections, the Butterflies (*Rhopalocera*) and Moths (*Heterocera*), which may usually be distinguished from each other by the form of the antennæ, those of the Butterflies having knobs at their tips, whilst those of the

Moths are pointed. Once more it may be mentioned that perfect insects do not grow, and if the reader find two Butterflies similar in appearance but differing considerably in size, it may be assumed that they are not of the same genus. Only in very exceptional instances is this not the case, and it may be accepted as an axiom that a small Butterfly will not grow into a larger one.

There are various Butterflies commonly known as 'Whites,' which belong to the family Pieridæ. The Large Garden, or Cabbage White Butterfly (*Pieris brassicæ*) is common throughout the British Isles. The wings are white, except for patches of black at the apex of the fore-wings, and a smaller black patch on the anterior border of each hind wing. The caterpillar is green with black tubercles, and it has a sprinkling of white hairs. It feeds on cabbage and many common garden plants. The Orange Tip (*Euchloë cardamines*) is a lovely delicate insect, with an orange patch at the tip of each fore-wing of the male. To many people it is the harbinger of spring as it flits about the Lady's Smock, or Jack-in-the-Hedge. The female is less noticed, as she does not possess the orange markings, but she may be distinguished easily from other small whites by the marbling of green on the undersides of her hind wings. The Clouded Yellow and Brimstone Butterflies belong to this family.

The most noticeable member of the family Papilionidæ is the Swallow-tailed Butterfly (*Papilio machaon*). The colour of its wings is black, variegated most beautifully with yellow markings, and near the extremity of each hinder wing is a circular red spot, surmounted by a crescent of blue, and the whole surrounded by a black ring. It flies with exceeding rapidity, nearly in a straight line, and is very difficult to capture.

In the family Nymphalidæ is a vast number of species, most of which are notable for their brilliant colouring, many of them being well-known natives of England. One of the finest examples of our British butterflies is the Common Peacock (*Vanessa io*). It may be seen rather plentifully in fields, roads, or woods, and the beauty of its colouring never fails to attract admiration. The caterpillar feeds chiefly upon the stinging-nettle. Its common colour is black, studded with tiny white points. The chrysalis is one of those which hang suspended during the time of their nonage, and is frequently infested with the ichneumon-fly. The Red Admiral (*V. atalanta*) is a radiant creature, whose name is probably a corruption of 'Admirable.' The yellowish green caterpillar may be found on nettles. The Painted Lady (*V. cardui*) is found as far north as Shetland. The Camberwell Beauty (*V. antiopa*) is always rare in the British Isles. It is strikingly handsome in appearance; its rich, velvety brown wings are margined with pale yellow and then banded with black, which contains a series of blue spots. The Tortoise-shell Butterflies are brilliant insects, with markings not unlike those of tortoise-shell.



Its body is thick, stout, and massive, and its wings wide and spreading. The larva itself is only a little smaller than that of the Death's-head Moth, and is by no means an attractive-looking creature. Its body is smooth and shining, mainly a dull mahogany-red tinged with ochreous yellow, and there is a large oval patch of chestnut on the back of each segment. It has a curious wedge-shaped head, and its muscular power is remarkable. The caterpillar passes three years in the larval stage of its existence. When the time comes for its change, it ceases to burrow, and scoops out a convenient cell in a tree, lining it with a fabric of mixed wood scrapings and silken threads. This long existence in the pupal state is in marked contrast to some of the butterflies, which emerge from the chrysalis in ten days or a fortnight.

The Tiger-Moths (Family : Arctiidae) are not so named, as in the case of the tiger-beetles, on account of their ferocity, but because of the colour and pattern of the wings of one species, viz., the Tiger-Moth (*Arctia caja*). The scientific name of the family refers to the bear-like look of the larva, which is called 'woolly bear,' 'hairy worm,' etc. It is rather large, and is surrounded with tufts of long elastic hairs of a reddish brown colour. When disturbed, it rolls itself round, just as a hedgehog does, and if on a branch, suffers itself to fall to the ground, when the long hairy covering defends it from being injured by the fall. When the caterpillar is about to change to a pupa, it spins a kind of hammock, and lies there until it comes forth as a moth.

The Cream-spot Tiger-Moth (*A. villica*) is one of several species that some people fancy is too brightly coloured to be a moth, being under the impression that all moths are dingy compared to the butterflies. Its fore-wings are black, with eight cream-coloured or yellow spots, and the hind wings are yellow, with half a dozen black spots and masks. The head and thorax are black, the latter with a white streak on each side; the abdomen is yellow above, and is marked with three rows of black dots. The caterpillar is velvety black, with tufts of brown hairs; its head and legs are reddish brown. It feeds chiefly on plantain, dock, chickweed, etc.

Belonging to the family Notodontidae is the Puss Moth (*Cerura vinula*) which takes its name from its furry appearance. It is light bluish grey in colour with black markings. The caterpillar is an extraordinary creature. Its colour is bright green striped with white. It has a forked tail from which it thrusts two scarlet threads when alarmed. It constructs its cocoon on the bark of a tree, preferably the willow; it is composed of chips and gum, and so greatly resembles the bark upon which it is placed that it needs a trained eye to discover it.

One family, the Geometridae, derives its name from the mode of walking adopted by the larvæ. These creatures have no legs on the middle of the body, and are in consequence unable to crawl in

the usual manner. Their mode of progression is called 'looping,' and the caterpillars are called 'loopers.' When one of these larvæ advances, it grasps the object firmly with its fore-feet and draws the hind feet close to them, forming the body into an arched shape. The hinder feet then take a firm hold, the body is projected forward, until the fore-feet can repeat the process. The whole action of the larva reminds the observer of the leech when crawling. The Swallow-tailed Moth (*Urapteryx samburica*) is common in England, the south of Scotland, and Ireland. It is a rather large insect, with tailed hind wings, both pairs of which are pale sulphur-yellow marked with olive-green transverse lines.



GREAT ATLAS MOTH
(Less than one-third natural size)

The few Butterflies and Moths that have been briefly described are all found in this country, and though some of them are exceedingly beautiful, they cannot compare with many of the tropical species for size or brilliantly metallic colouring. The Lepidoptera, especially the butterflies, except for the occasional ravages of caterpillars, afford man much pleasure, gladdening the heart of every true lover of Nature as they flit about in the sunlight. To beauty they add the character of being perfectly harmless, for no butterfly or moth is noxious, and only a few caterpillars are capable of causing irritation when handled carelessly.

The Saturniidae is a family of large Moths, with a small head, broad wings, and a body clothed with thick woolly hair. The abdomen does not extend beyond the hind wings. The Emperor Moth (*Saturnia pavonia-minor*), one of our native representatives of the family, is a handsome insect, quite unlike any other species found in this country. There is a beautiful eye spot on each of the four wings, which have an expanse of from two and a quarter to three inches. The female flies at night, but the male comes out in the daytime also, in fine weather. The caterpillar is decidedly pretty. At first it is black, but changes into green, with each



CECROPIAN SILK-MOTH

of its segments marked with a black and pink ring, spotted with yellow and adorned with little tufts of black bristles. The dark brown chrysalis is enclosed in a flask-shaped cocoon.

This family contains the largest known Lepidopterous insect, namely, the Great Atlas Moth (*Attacus atlas*) of India. In the British Natural History Museum is a specimen that measures eleven and three quarter inches across the tips of its wings, although the average is two or three inches less. There are other members of the family, not particularly notable for either size or beauty, that

are of inestimable value to mankind because of their ability to produce silk. The Oak Silk-Moths of China and Japan spin cocoons that yield material that is extremely useful, though not of fine quality.

In the same family is the Cecropian Silk-Moth (*Samia cecropia*) of North America, which is about half the size of the Atlas Moth from tip to tip of the wings. Its head is red, collar white, thorax covered with reddish brown hair, and its abdomen is orange-brown with white bands. The general colour of the wings is reddish brown, varied with different shades of brown, orange, grey, and buff, and there are various zigzag lines of white. A large curved white spot is exhibited on the hind wing. The caterpillar is green, with a yellow head and legs, and each segment is marked with two blue spots. The larva feeds on the wild plum, but in confinement will eat apple. The yellowish brown cocoon is the size of a pigeon's egg; the outside covering consists of silk of a coarse texture, while the inner substance is much finer. This silk can be carded and spun into material that will make serviceable stockings, etc. The Moth shown in the photograph has only just emerged from the cocoon, and is awaiting the hardening of its body and wings, preparatory to taking flight.

The fine silk-spinners belong to the family Bombycidæ, of which the best-known member is the Common Silk-Moth (*Bombyx mori*). It has a thick short body, stout legs, and white wings, with two or three dark lines parallel to the margin. It lays its eggs on the leaves of the mulberry tree, upon which the larva feeds. The silk is secreted in two large intestine-like vessels in the interior of the caterpillar, which becomes enormously large when about to change into a pupa. Both the silk organs unite in a common tube at the mouth, technically called the spinneret. Through this tube is ejected a semi-liquid, that hardens into a soft, shining fibre as soon as it comes in contact with the air. The caterpillar employs the silk for the purpose of constructing a cocoon in which it can lie until it has assumed the perfect form. The Silkworm has been reared in India, China, and Japan, from time immemorial, and when our ancestors were clothed with the skins of wild animals, the Chinese peasants wore silken garments. In later times the cultivation of the Silkworm spread to the southern countries of Europe, but the British climate is unsuitable.

In the preparation of the silk, the cocoons are thrown into warm water to rid the threads of glutinous matter. The silk is then wound and, usually, a single cocoon yields three hundred yards. Dr. Yeats calculates that 12 lbs. of cocoons produce 1 lb. of silk. One ounce of silkworms' eggs will produce 100 lbs. of cocoons; 16 lbs. of mulberry leaves are food sufficient for the production of 1 lb. of cocoons, and each mulberry tree yields about 100 lbs. of leaves. With these figures at hand, the reader may care to calculate the

number of insects, eggs, trees, and leaves necessary for the production of over 4,000 tons of silk, which is the average yearly output of Italy alone, where some half million persons are engaged in rearing silkworms.

ORDER : HYMENOPTERA

THE MEMBRANE-WINGED INSECTS

This is a particularly interesting order, if only because it contains the social insects, such as the ants, wasps, and bees. The distinguishing features of its members are the possession of both a biting and a sucking mouth ; generally four wings, transparent, membranous, only slightly veined, and the hinder pair smaller than the fore pair ; and the creatures all undergo complete metamorphosis. One section of the Hymenoptera, called the Aculeata, comprises those species whose females, instead of an ovipositor, are furnished with a retractile sting capable of ejecting poison. A male wasp, or even a male hornet, is quite incapable of inflicting injury upon anyone ; but a victim is not always allowed sufficient time in which to make certain of the sex. The principal families of the order are the Saw-Flies (Tenthredinidæ), Gall-Flies (Cynipidæ), Ichneumon-Flies (Ichneumonidæ), Social Ants (Formicidæ), Burrowing Wasps (Crabronidæ and Philanthidæ), Paper Wasps (Vespidæ), Honey-Bees (Apidæ), and Solitary Bees (Andrenidæ).

The Saw-Flies may be recognised by the curious piece of animal mechanism from which they derive their name. The females of the family are supplied with a pair of horny saws, placed side by side on the lower extremity of the abdomen. The saws act alternately, one being pushed forward as the other is being retracted. Their object is to form a groove in some plant, in which the eggs of the mother are deposited, and wherein the larvæ will find a supply of nourishment in order to enable them to complete their development.

Among the commonest species are the Pine Saw-Fly (*Lophyrus pini*), which lays its eggs in pine needles ; the Rose Saw-Fly (*Hylotoma rosæ*), the Turnip Saw-Fly (*Athalia spinarum*), and the Gooseberry Saw-Fly (*Nematus ribesii*). The last-named is a yellow insect, except for the thorax, which is spotted with black. It is only a quarter of an inch in length, but is a great garden pest. The larvæ are the caterpillars, pale green with black dots, which often infest gooseberry bushes, stripping them of their leaves and preventing the ripening of the fruit.

The Pine Sirex (*Sirex juvencus*), or Pine Borer, is one of various species that are furnished with a borer instead of a saw, with which to make a hole in a leaf or twig for the reception of the eggs. It is about an inch and a quarter in length ; in colour it is violet-black, glossed with blue. It is not common in Britain, but is often introduced into our woodyards in foreign timber. The larvæ are said

sometimes to remain in solid wood perhaps for years, not coming to maturity and emerging until after a tree has been felled, sawn into planks, and used in the construction of a house.

The Gall-Wasps, or Gall-Flies, of which there are many species, deposit their eggs under the cuticle of plants, which lead to the formation of an excrescence known as a gall, in which the larvæ lives and grows. Nut-galls, as they are called, are of great economic value, as they contain much tannin and gallic acid, and are largely employed in tanning and dyeing, and the preparation of ink. The best galls come from Asia Minor, the Persian Gulf regions, and India. The Common Oak-Gall Wasp (*Cynips folii*), glistening black in colour, deposits its eggs on the under side of oak leaves.

Leaving the insects which are parasitic on vegetable substances, we come to a group containing numerous species that are parasitic on larvæ, as well as attacking many other insects and spiders. The ovipositor is straight, and is employed in inserting the eggs into other insects, especially when in their larval state ; but in some instances it is used like a carpenter's bradawl for piercing solid wood. The Ichneumon-Fly (*Ichneumon pisorius*) is a capital type of the family, being not only one of the largest, but also one of the most brightly coloured, usually presenting a combination of black, white, yellow, and red. Its favourite victim for the attachment of an egg is the larva of the hawk-moth. The caterpillar does not appear to suffer any noticeable inconvenience ; it passes into the chrysalis stage in the usual manner, but the final outcome is an Ichneumon-Fly instead of a moth.

In the great Aculeate division of the Hymenoptera, the ovipositor of the female is changed into a sharply pointed weapon, popularly called a sting, and connected with a gland in which is secreted a poison closely analogous to the venom of a serpent's tooth.

The true Ants have ever been famed for their social and industrial habits. Their recognition of an orderly system of government is only paralleled among the insects by the termites, wasps, and bees, and among all other living creatures only the social organisations of man can compare with these wonderful insect assemblies.

The Common European Ants are generally either blackish or reddish in colour ; the largest British species is the Red Wood-Ant (*Formica rufa*). As in the case of the termites, the great bulk of the inhabitants of a colony is composed of workers, or neuters. The perfect insects of either sex take no part in the daily tasks, their sole object being to keep up the numbers of the establishment. In the Ants, moreover, the neuters are without wings, and even the perfect insects only retain these organs for a brief period of their existence. The so-called ' ants' eggs,' often used for bird food, are simply the cocoons in which the insects are passing their pupal state before emerging in their winged condition. As soon as they gain sufficient strength, they fly upward into the air, where they seek their mates,

and soon descend to the earth. In a very short time the males die, and the females commence preparations for their future households. They break off their own wings and reduce themselves to the wingless state of a worker, and then they supply a vast quantity of eggs, which are carefully stored away and nurtured until they



burst forth into the three states of male, female, and neuter. Ants feed upon vegetable matter, insects, etc. They are particularly fond of sweet substances, and some species have a liking for the liquid given off by the aphids, or green-fly, that commonly infests rose-bushes. The Ants not only milk these insects while they are on the plants, but they actually capture them, convey them home, and stall and feed them like cattle.

The Red Ant (*F. sanguinea*) is an example of various slave-making species. These creatures invade the nests of the Brown Ant (*F. fuscus*), carry off the pupæ and hatch them in their own nests, where they labour with perfect cheerfulness, unacquainted, indeed, with the fact that they are in captivity.

The Foraging Ants (*Eciton*) of Central and South America travel in enormous numbers, but always in line or column formation. They are terribly destructive; they eat everything softer than stone or metal. They pass through houses, and at their approach all the human inhabitants vacate the premises. In this case, however, the visits of the Ants are beneficial, for when the column has passed fairly through a house, no living creature is left within its walls; beetles, spiders, scorpions, centipedes, and even rats and mice being torn to pieces by the myriad powerful jaws. The Driver Ants (*Anomma*) of Africa, are probably still more formidable, for their victims often include snakes of no inconsiderable size.

In different families are many hundreds of species of Ants that do not live in large communities. The larvæ of one species (*Mutilla europæa*) are often the unwelcome inhabitants of the nest of humble-bees, where they feed upon the bee grubs; and other species bury their eggs separately in loose sand, placing with each a supply of flies or spiders for the larva to feed upon.

The Sand and Wood Wasps are characterised by very similar habits. They make burrows in the ground or in posts for the

depositing of their eggs. The spiders and insects which are captured and immured to serve as food for the future progeny, often only receive a wound sufficient to paralyse them, so that they lead a semi-torpid life until they are killed and eaten by the young grub. One species (*Philanthus triangulum*) provides at least five dead or stupefied bees for each of its larvæ, which leads to no small loss to bee-keepers where this Wasp abounds.

The true Wasps are called Paper-Wasps, because the substance of which the nest is made is a paper-like material, obtained by nibbling woody fibres from decayed trees or bark, and kneading it to a paste between the jaws. The nest is globular in shape, with walls of considerable thickness to prevent damage by falling earth. The cells are hexagonal, and laid tier above tier, all the open ends being downwards, instead of laid horizontally, as is the case with the bees. The grubs are fat, white, black-headed creatures. They are fed with other insects, fruit, sugar, meat, or honey, the mingled mass being disgorged from the stomachs of the nurses and thus given to their charges.



COMMON WASP (FEMALE)

There are seven different kinds of gregarious Wasps in our country, some nesting in the ground, while others prefer shrubs and bushes. The Common Wasp (*Vespa vulgaris*) often appropriates a deserted rat- or mouse-hole, but sometimes excavates for itself.

The Common Hornet (*V. crabro*) is distinguished easily from all other species of wasp by its larger size and different colouring; the Common Wasp is black and yellow, whereas the Hornet is red-brown, with yellow markings; and a small worker Hornet is bigger even than a queen wasp. After hibernating through the winter, a single female commences to build a nest in the ground, in a hollow tree, or under the eaves of a house. She constructs a number of cells, in each of which she deposits an egg. When these are hatched, she supplies the young with food, and as soon as they reach maturity they complete the home and take up the duty of nurturing the remaining young grubs.



HORNET (FEMALE)

There are no insects more important to mankind than the Honey-making Hymenoptera, which, notwithstanding their provision of the sweet substance, are furnished with stings, intensely poisonous in some species. The Common Hive-Bee (*Apis mellifica*) is so well-known that a merely general sketch will serve our purpose. The waxen six-sided cells are constructed with mathematical accuracy,

and in each one is placed a larva, which is fed by the neuters. The wax is secreted in the form of scales under little flaps, which are situated on the underside of the insect. It is pulled out by the Bee and moulded until a piece of tenacious wax is formed. The cells in which the Drone or Male Bees are hatched are much larger than those of the ordinary workers. The royal cells are the largest of all, and are oval in shape. Worker larvæ are placed in royal cells for adoption, in case the Queen Bee should die, and there be no other queen to take her place.

The Queen Bee lays about eighteen thousand eggs. Of these about eight hundred are males and four or five queens, the remainder being workers.

In gathering honey, the Bees lick the sweet juices from flowers, swallow them, and store them for the time in a membranous sac, popularly called the honey-bag. When this sac is filled, the Bee returns to the hive and discharges the honey into cells, closing its mouth with wax when it is filled.

A most remarkable feature about Bees and Wasps is the manner in which they unerringly find their way straight home from a distance as great as two miles. Some naturalists maintain that it is accomplished by the observance of conspicuous landmarks, but a French scientist recently proved that the insects do not depend necessarily upon sight to guide them, for when he blinded specimens by means of blackened collodion, they were at no loss concerning the right direction. He next removed the antennæ, which are believed to be the olfactory organs, but the Bees still returned home ; and he therefore concluded that the insects possess some special 'sense of direction.' It has been pointed out, however, that the experiment was not sufficiently complete to justify the conclusion, since no trial was made with insects that were deprived of both sight and antennæ. It may be that eyes or antennæ alone are sufficient to guide the Bee home, either sufficing when deprived of the other one.

The Common Humble-Bee (*Bombus terrestris*) is the best-known of about a dozen species in this country. With its velvety clothing and bright colours it is rather a favourite with most people, and the idea is very prevalent that it does not sting. It is probably less ready to use its weapon than other species, but, nevertheless, it can sting pretty severely. This insect is of considerable value to the farmer, for with its longer tongue it can fertilise the red clover, whereas the hive bee is unable to reach the nectary. When red clover was introduced into New Zealand, it was found impossible to fertilise it until Humble-Bees were imported to accomplish it.



HUMBLE-BEE (FEMALE)

Among the Solitary species the Leaf-cutting Bees are particularly interesting. They burrow in decayed wood, or in the ground,



LEAF-CUTTING BEE (FEMALE) AND NEST

making their cells of portions of leaves which they cut out in semi-circular, or nearly circular, pieces. The female Leaf-cutter Bee (*Megachile maritima*) holds the edge of the leaf with her legs, and cuts out the piece she requires by means of her mandibles. Each cell, which is about half an inch long, is composed of many pieces of leaf, cemented together with a gluey excretion. When the cell has been provisioned with pollen, etc., an egg is laid upon it, and then the receptacle is closed up with several rounds of leaf placed one upon the other.

The Carpenter Bees show considerable variety in nesting methods. Some of them construct their cells in solid wood, but the little Bee (*Osmia rufa*) will select any available crevice. One insect chose a flute which had been left in a garden arbour, and in the tube of the instrument built fourteen cells. The flute is exhibited in the British Natural History Museum. Other species tunnel in the pith of brambles, or build in empty snail shells. Another kind of nest consists of pitcher-shaped cells of mud, which are fixed among grass roots.

ORDER: DIPTERA

THE TWO-WINGED FLIES

The Diptera may be recognised not only by the single pair of wings, but by the little appendages at their base, called 'halteres' or balancers, and which are only vestiges of the hinder wings. The wings are not capable of being folded. In a few cases, for example, the Bluebottle-Fly, at the base of the wings are two ear-shaped

lobes, called winglets. These insects suck their food instead of biting it, and though they have no tail stings, various species can insert their proboscis into one's flesh with equally unpleasant effect. The Diptera larvæ undergo very complete metamorphosis; and the grubs or maggots are generally without legs. Flies are capable of immense annoyance to man; they injure agricultural produce in all stages of growth; they attack domestic animals, and may be the means of conveying disease to human beings. In our country various species of Flies are only exceedingly troublesome, but in some parts of the world their hordes constitute very serious plagues. The order is of vast extent, and includes a whole host of species. Only a few of the numerous families may be mentioned: The Typical Flies (Muscidæ), Daddy-longlegs (Tipulidæ), Gnats (Culicidæ), Drone-Flies (Syrphidæ), Horse-Flies (Tabanidæ), Gad-Flies (Æstridæ), and the Fleas (Pulicidæ, etc.)

The Common House-fly (*Musca domestica*) and the Bluebottle-fly (*Calliphora vomitoria*) are excellent examples of the typical Flies. The former is common everywhere, regardless of either heat or cold; the latter is chiefly remarkable for the keen sense by which it discovers animal matter in which to deposit its eggs. In warm weather the housewife is only too familiar with the rapid manner in which the eggs develop into larvæ in an unprotected joint of meat. It has been affirmed in earlier pages that the perfect insect never grows. Yet very little observation shows that Bluebottles are certainly of different sizes, and it is quite natural to assume that the smaller insects will gradually increase in size. The assumption, however, is entirely wrong. The size of any fly depends entirely upon the dimensions of the maggot before entering the pupal state. Larvæ with an abundant supply of food attain a greater length and fatness than those whose opportunities are more restricted, and, finally, are converted into larger or smaller Flies accordingly. It must be remembered that although Flies are a nuisance in a house, they are useful scavengers for removing much decaying animal and vegetable matter that would otherwise long pollute the air.

The Daddy-Longlegs, or Crane-fly (*Tipula gigantea*), is quite harmless in a perfect state. In a larval condition it is a fearful pest, living just below the surface of the ground and feeding on the roots of grasses, etc. Whole acres of grass are sometimes destroyed by these larvæ, which are called 'Leather-jackets.'

The Gnats are very annoying insects, for they exist in myriads, and torment man and beast alike. The males, which easily may be recognised by their plumed antennæ, are not to be feared; but the females are confirmed bloodsuckers, and most persons at some time or other have experienced the sharp prick as the proboscis of a Gnat is thrust into one's skin. The largest British species is the Banded Gnat (*Culex annulatus*), which has spotted wings and striped abdomen and legs. The Common Gnat (*C. pipiens*) is a

smaller yellowish-brown insect with golden-yellow hairs on the thorax. The eggs of the Gnat are laid in, or rather upon, water, and are built, as fast as laid, into a boat-like shape, which possesses such powers of flotation that even if water be poured upon it the mimic vessel turns out the water and rights itself. When hatched, the larvæ fall into the water, and begin at once to make themselves very conspicuous by continually twisting and jerking themselves about. In process of time the larva changes into an active pupa, and finally the pupal skin splits along the back and forms a kind of raft, on which the Gnat stands until its wings have attained sufficient strength for flight.

The Spanish word for Gnat is 'Mosquito,' by which name the insects are generally known abroad. In some regions they are so numerous that they fill the air like clouds of dust. Owing to their methods of breeding, they are more numerous in the neighbourhood of water, especially swamps. Mosquito-curtains were in use in the English Fen-districts less than a century ago ; but owing to better drainage the insects have greatly diminished in this country. In many parts of the world, in regions as dissimilar as Lapland (p. 199) and Central Africa, they render life almost unbearable. Messrs. Grogan and Sharp, in their journey afoot from the Cape to Cairo, suffered terribly.

"The flies by day and the mosquitoes by night rendered life well-nigh impossible. . . . They arrived at sunset with a long-drawn expectant howl ; little ones, big ones, black ones, mottled ones, a whirling fog of miniature vampires. . . . My surviving Ruanda man succumbed to their attacks ; he had been ailing for some time, and being too desperate to keep them off, he was literally sucked dry. It was absolutely necessary to turn in half an hour before sunset, and to make all the preparations possible for the night. I piled up belongings round the edge of my net, and kept a green wood fire burning at each end ; then I lay inside, smoked native tobacco of remarkable pungency, and prayed for morning, when I used to turn out feeling perfectly dazed from the amount of poison that had been injected during the night."

Scientific investigation has proved beyond all doubt that various diseases are disseminated by means of Mosquito bites, and especially malarial fever, which is so deadly to Europeans in many tropical regions.

The Drone-fly (*Eristalis tenax*) is a capital example of protective resemblance, bearing a wonderful likeness to the hive-bee, and moving its abdomen in a manner that leads an unaccustomed observer to fancy that it possesses a sting. A spider will attack without hesitation a bluebottle that blunders into its web, but will be more wary when dealing with a captive bee and, momentarily at least, it will treat a Drone-fly with similar respect. The larva of this insect is known as the 'Rat-tailed maggot,' on account of its

peculiar construction. It resides in mud, with the head downwards. In order to enable it to breathe, the respiratory tubes are carried into a long and telescopic appendage attached to the tail, the end of which is furnished with a brush of hairs something like that on the tail of the gnat larva. In both of the creatures the extremity of this curious organ is always held out of the muddy water, and it is most curious to see the grubs elongate their tails as the depth of water is increased.

The Horse-flies, or Breeze-flies (Family: Tabanidæ), are well-known biters and suckers, the females of which afflict horses and cattle, while the males frequent flowers. A British species is the Common Cleg (*Hæmatopota pluvialis*), a grey insect with spots of black upon its abdomen. It is commonly and erroneously accounted one of the Gad-flies by persons who experience its unwelcome attentions when walking in fields or woods, whereas the true Gad-flies are members of the family Œstridæ. They are sufficiently large often to be mistaken for some species of bees, especially the Horse Bot-fly (*Gastrophilus equi*), which strongly features the honey-bee in both form and colour. The Fly lays its eggs on the skin of horses, asses, and mules, always selecting a spot within reach of its victim's mouth. When the eggs develop into maggots they irritate the skin of the horse, which thereupon licks the sore spot and swallows the larvæ, which complete their development while affixed to the inner wall of the stomach of the quadruped. The Ox Warble-fly (*Hypoderma bovis*), or Ox-bot, is one of the worst of our native pests. It deposits its eggs on the skins of cattle. When hatched the maggots bore their way into the flesh, where they cause the formation of large tumours. It is calculated that this Fly causes to British farmers and stock-raisers an annual loss of £8,000,000. The Sheep Bot-fly (*Œstrus ovis*) is another troublesome and costly insect that causes much suffering to sheep and financial loss to their owners.

The Tsetse-fly (*Glossina morsitans*) is a brown insect with yellow bars across the abdomen. Though only a little larger than the common house-fly, it is the curse of Equatorial Africa. Originally, it swarmed in one part of the west, but it has spread to other regions. Horses, cattle, and dogs only need to be bitten once, inevitably to die after a longer or shorter period of suffering. The afflicted animal's eyes and nose begin to run, the body swells, and becomes gradually emaciated, and the whole flesh and blood are unnaturally changed until death supervenes from extreme exhaustion. Yet, strangely enough, the troops of wild animals on the plains suffer little or no ill-effects from bites, certainly no more irritation than results from gnat-stings.

The Fleas have lost their wings owing to their parasitical habits, for, in Nature, disuse of any organ ultimately leads to its loss. The strength and agility of the Common Flea (*Pulex irritans*) are

perfectly wonderful. The apparatus with which it extracts the blood of its victims is very curious, and forms a beautiful object under a microscope. In all these insects the hinder pair of legs are very long and powerful, and the leap is tremendous in proportion to the creature's size.

The Jigger, or Burrowing Flea (*Sarcopsyllus penetrans*), another terrible pest in Central Africa, is scarcely bigger in size than a pin's head. It burrows under the skin of the feet and hands, where it lays its eggs. Speedy removal of the intruder leads to little inconvenience, but any delay allows the hatching of the eggs, when a multitude of tiny fleas honeycomb the flesh, with ensuing mortification and very serious consequences.

ORDER: COLEOPTERA

THE BEETLES

Popularly known as Beetles, the insects in this comprehensive order have the front pair of wings modified into stout, horny cases, technically called the elytra, under which the hinder wings are folded when not in use. The elytra are of no service for flight. In the Orthoptera the fore pair of wings, which slightly overlap each other, are also only covers for the hinder flying pair; but in the Beetles the elytra mostly meet in a straight seam, and they are generally hard and brittle, instead of being leathery. In these sheath-winged insects the mouth is furnished with jaws, which are often of considerable power. The various species undergo complete metamorphosis, and the larvæ are usually soft-bodied grubs that live in concealment.

In our country there are several thousands of species of Beetles, and probably thirty times as many in foreign regions. The order is divided into four great sections, according to the number of small joints immediately behind the claw which terminates the leg. Beetles with five joints in each tarsus are called the Pentamera; those with five joints in the tarsi of the fore-legs, and four joints in the tarsi of the hind legs form the Heteromera; those with four joints in each tarsus are the Tetramera, and those with three joints in each are termed the Pseudotrimera. Our few selected specimens, most of which are representatives of distinct families, merely touch the fringe of hosts of Coleopterous insects, with which are included more than a few that are not viewed popularly as Beetles, for example, the glow-worms, lady-birds, etc.

The Tiger Beetles, which represent the family Cicindelidæ, are also called 'Sparklers.' Both of their names are very appropriate, for they are active, voracious, and ferocious in habits, and their brilliant colours flash in the sunshine. One of the chief British species is the Green Tiger Beetle (*Cicindela campestris*). It runs with such rapidity that the eye can scarcely follow its course. Its

jaws are like two reapers' sickles, crossing each other at the points ; its eyes project from the side of its head so that it can see in any direction without turning itself ; and with its agile wings the creature can rise in the air as readily as a fly or a wasp. It is a pretty insect, bright green marked with whitish spots, and the legs are coloured a beautiful rosy copper. When flying in the sun, it flashes and glitters very conspicuously. Even in its larval state the Tiger Beetle is a terror to other insects, snapping them up as they pass by its burrows, and dragging them into the dark recesses of the earth to be destroyed.

The Bombardier Beetle (*Brachinus crepitans*) of the family Carabidæ has a reddish-brown body, and elytra, dull black, tinged with blue. Its chief characteristic is the possession of glands from which it can eject an acrid and offensive-smelling liquid with considerable force. Sometimes the liquid is volatilised and discharged in little clouds of smoke, hence the name of the insect.

There are numerous families of Water Beetles. In the family Dytiscidæ is the Common Water Beetle (*Dytiscus marginalis*), which is typical of various water-loving species. In order to fit them for their aquatic existence, their hind legs are developed into oars with flattened blades and stiff hairy fringes, and the mode of respiration is altered to accommodate itself to the surrounding conditions. The spiracles are set rather high, so as to be covered by the hollowed elytra, beneath which is carried a tolerable amount of air. When necessary, the Beetle rises to the surface, pushes the ends of the elytra out of the water, and takes in a fresh supply of air. The Whirligig Beetle (*Gyrinus natator*) and the Great Black Water Beetle (*Hydrophilus piceus*) represent two distinct families. The former cannot fail to attract notice as it skims about the surface of the water in a perfect maze of intricate and speedy evolutions. The latter differs from the preceding species in not being of carnivorous habits, for it is a poor swimmer and would be unable to catch any but the slowest prey. Its food consists of vegetable substances.

The Rove Beetles (Family : Staphylinidæ) are popularly known by the name of ' Cocktails,' on account of their habit of curling up the abdomen when alarmed or irritated. The Common Black Rove Beetle (*Ocypus olens*), when it stands its ground defiantly with open jaws and elevated tail, presents quite a diabolical aspect, and is called by rustics the ' Devil's Coach-horse.' It is a useful insect, for its food consists chiefly of slugs, snails, insect larvæ, etc.

The Burying Beetles (Family : Silphidæ) are famous for their curious and valuable habits. It is owing to the exertions of these little scavengers that the carcasses of birds, small mammals, and reptiles are seldom seen to cumber the ground. The plan adopted is by burrowing underneath the corpse and scratching away the earth, so as to form a hollow into which the body sinks. The object is to

gain a proper spot wherein to deposit their eggs, as the larvæ, when hatched, feed wholly on decaying animal substances. The Burying Beetle (*Necrophorus rufator*) is one of six or seven species found in Britain. In colour it is black, with yellow bands.

The Stag Beetle (*Lucanus cervus*) is one of the group of Lamellicorn Beetles, so called from the beautiful plates, or lamellæ, which decorate the antennæ. It is the largest of the British Coleoptera.



STAG BEETLE

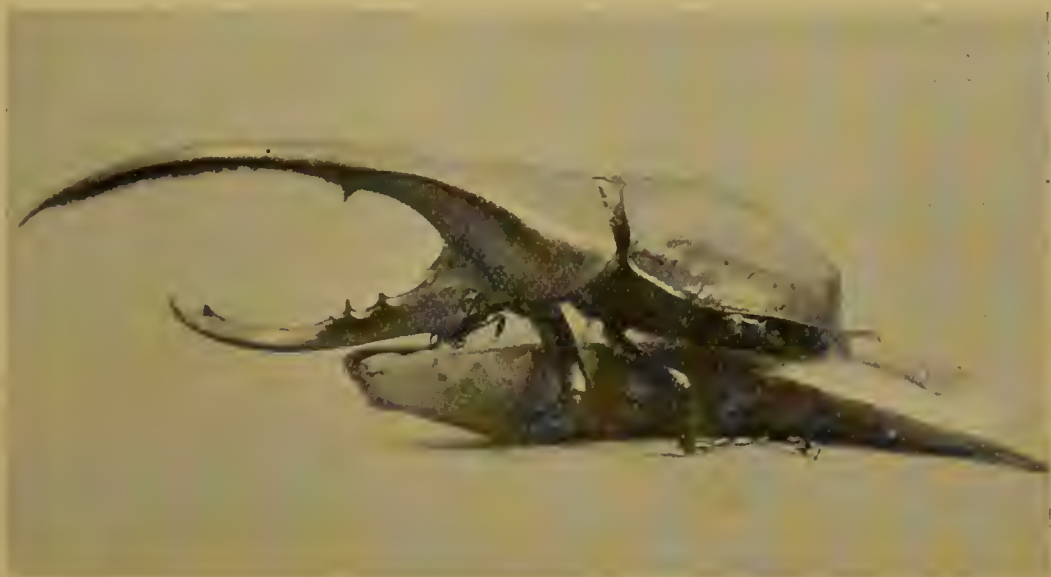
When it has attained its full dimensions it is rather a formidable insect, its enormous mandibles being able to inflict a painful bite. These horn-like jaws only belong to the male, those of the female being simply sharp and curved, and in no way conspicuous. From the shape of the mandibles it might be supposed that the

Stag Beetle was one of the predaceous species. Its food, however, consists mostly, if not wholly, of the juices of vegetables, which it wounds with the jaws so as to cause the sap to flow.

The Common Cockchafer (*Melolontha vulgaris*) is no relation to the cockroach, being a member of the family Scarabæidæ. Its life history is exceedingly interesting. The mother beetle commences operations by depositing the eggs in the ground, where in good time the young are hatched. The grubs are unsightly-looking objects, having the end of the body so curved that the creatures cannot crawl in the ordinary fashion, but are obliged to lie on their sides. They are furnished with two terribly trenchant jaws, like curved shears, and immediately commence their destructive labours. They feed mostly upon the roots of grasses and other plants, and, when in great numbers, have been known to ruin an entire harvest. For three years the future insect continues in its larval state, and after a brief sojourn in the pupal condition, changes its skin for the last time, and emerges from the ground a perfect Cockchafer.

The Hercules Beetle (*Dynastes hercules*) is a native of tropical America. The specimen depicted in the photograph is feeding upon a banana, which assists one to realise the size of the insect. The

male often exceeds five inches in length, the strange, horn-like projection from the thorax being nearly as long as the remainder of the body. The Goliath Beetle (*Goliathus cacicus*) is found in West Africa ; it grows almost to the size of a man's fist. The grub



HERCULES BEETLE

feeds upon decayed timber, but spends the chrysalis stage in an underground cocoon, which is of very unusual construction. Around the middle of the outside is a thick ridge, and it is a perfect puzzle how the insect contrives to make it, since the grub necessarily works from the inside.

Either through books, or by actual observation, almost everyone is familiar with the Glow-worm, of which there are various species in the family Lampyridæ. The luminous organs are situated in the abdomen. The male and female of the Common Glow-worm (*Lampyrus noctiluca*) are remarkably unlike ; the former is soft brown in colour, long-bodied, and wide-winged, altogether beetle-like ; while the female more resembles a grub than a perfect insect, has no wings at all, and only the slightest indications of elytra. It is often stated that the female alone is luminous ; but it is certain that the male is gifted with the power of producing the phosphorescent, pale, greenish-blue light, though in a smaller degree than its mate.

The Fire-flies are among the most remarkable members of the whole Coleoptera. There are numerous beetles, especially in the tropics, with colours that flash in the sunlight with the most dazzling hues ; but the Fire-flies are nocturnal, and burn with a lustre far surpassing that of the glow-worm in England. There are very many species, all belonging to the genus *Pyrophorus*. At night in the tropical forests the air is filled with myriads of blazing stars,

crossing and recrossing in every direction, making the deepest glades luminous with their flaming lamps, and appearing and vanishing as if suddenly brought into existence, and as suddenly annihilated.

The great section Pentamera may conclude with a species that is commonly known as the Death-Watch Beetle (*Anobium panicum*). It is a small insect that burrows into wood, leather, and even provisions. It produces a ticking noise by striking its jaws against resounding wood; usually the sound is the signal of an insect to its mate. Superstitious persons, even in these enlightened days, view the regular ticking as a supernatural warning of death.

Of the Heteromera the family Meloidæ is one of the best known. The commonest species in this country is the Oil Beetle (*Meloe violaceus*). The insect is a dull indigo-blue in colour. When handled, it has the property of pouring a yellowish, oily fluid from the joints of its legs. In some countries the oily matter is believed to be a remedy for rheumatism.

In the Tetramera are the Weevils, embracing several thousand species, all of which are known by the peculiar shape and the very elongated snouts, at the extremity of which are placed small but powerful jaws. Various of these insects are very injurious to grain and fruit trees. The Nut Weevil (*Balaninus nucum*) is one that frequently forces itself upon the attention. The maggot that is found in nuts, and which leaves behind a black and bitter deposit that is so unpleasant to the taste, is the larva of the perfect insect. The Palm Weevil (*Rhynchophorus palmarum*) attacks the cocoanut palm. It works upwards from the roots, and eventually reduces the trunk to a mere ruined shell. Several species are known as 'leaf-rollers.' During the period of egg-laying, the female cuts a leaf across the middle and rolls it into a closed cylinder, or a sugar-loaf cell. In this receptacle the egg is laid. The leaf-roller is so insignificant in size—barely a quarter of an inch in length—that one wonders a creature so small can provide food and shelter for its young in such an ingenious manner.

The Colorado Beetle (*Leptinotarsa decemlineata*) is a vegetable feeder that is particularly destructive to the potato crops in North America. Sometimes it has been introduced into England, but vigorous and successful steps have been taken to prevent it establishing itself permanently.

In the last section of the Beetles is the family Coccinellidæ, or Lady-birds, the pretty little spotted insects with which we have been familiar from our childhood. Our commonest species are the Seven-spotted Lady-bird (*Coccinella septempunctata*) and the Two-spotted (*C. bipunctata*). The first-named has a black head and thorax, the wing cases are red with seven black spots upon them. It is an extremely useful insect, feeding while in the larval state on the aphides that swarm upon so many of our favourite plants and

shrubs. The mother Lady-bird always takes care to deposit the eggs in spots where the aphides most congregate, and so secure an abundant supply of food for the future offspring.

ORDER : RHYNCHOTA

The concluding order of the Insecta comprises many thousands of species, most of which undergo imperfect metamorphosis, and in their complete form exhibit great external differences ; but usually the mouth is developed into a long proboscis, specially formed for piercing and for sucking the juices of plants.

The Plant-Lice, or Green-Fly (Aphidæ), are small insects that inflict great injury on plants, and sometimes exist in countless myriads, when they are termed 'blight,' and are capable of wholesale destruction to crops. The Rose Aphis (*Aphis rosæ*) is a well-known example, but there are very similar insects that infest different kinds of fruit trees, and which are generally named after the plant or tree for which they exhibit a preference. The white substance that is often found on apple trees is produced by the Apple-blight insect (*Schizoneura lanigera*), and is often called the American blight, as it is supposed to have been introduced into this country from across the Atlantic. One of the most dreaded of these insect pests is the Phylloxera (*Phylloxera vastatrix*), that often makes sad havoc of the vines in France. The eggs are hatched, and the insects develop so rapidly to breed on their own account, that from a single female, during the course of but a few months, there may be millions of descendants.

Sometimes insects are introduced into other regions where they flourish amazingly, because their natural enemies are not present in the country of their adoption. The Californian orange plantations once suffered severely from an insect which had come from Australia. Eventually, certain species of Australian lady-birds were imported and set free in the plantations, and when they had multiplied, they made short work of the pest that was threatening the orange growers with ruin.

In the family Coccidæ is the Cochineal Insect (*Coccus cacti*). It is a native of Mexico, where it lives upon a species of cactus, but it has been introduced into Spain, India, and the East Indies. The insect is small, and of a deep mulberry colour. Immense numbers are reared for the sake of the brilliant crimson dye which their bodies produce when killed by boiling water, dried, and ground into powder. It is calculated that it takes seventy thousand insects to make 1 lb. of cochineal. The Lac Insect (*C. lacca*) is found on various species of fig tree in India and other eastern regions, where it forms masses of brown, resinous substance, which is used in the manufacture of sealing-wax, varnishes, lacquer, etc.

The Cicadas (Family : Cicadidæ) have large heads and beautiful membranous wings. The females are furnished with a curious

apparatus, by which they are enabled to cut grooves in the branches of trees for the purpose of depositing their eggs therein. The male Cicada has the power of producing a shrill and ear-piercing sound, so loud in many species that it can be heard at a considerable distance, and becomes a positive nuisance, like the same tune played for several hours without intermission.

In this order there are almost innumerable species of land and water Bugs, differing but little from typical Coleopterous insects.

CLASS : CRUSTACEA

THE CRABS, LOBSTERS, ETC.

The Crustacea is a very large class in which the members differ so considerably from each other that it is difficult to give a definition applicable to the whole without having recourse to highly technical details. They may, however, easily be separated from the Insects on account of their general structure, the head and throat being fused into one mass, called the cephalothorax ; the number of limbs exceeds the six legs of the insects, and the breathing is accomplished by gills and not by air tubes. The name Crustacea is sufficiently appropriate, for the creatures have their bodies and limbs covered with a hard, shelly crust. With few exceptions, chiefly terrestrial beings or inhabitants of fresh water, the young crustaceans do not resemble the parents until they have undergone a series of moults.

ORDER : DECAPODA

THE TEN-LEGGED CRUSTACEANS

The Crustaceans are divided into various sub-classes and more than a score of orders. The chief order, the Decapoda, contains three sub-orders, viz. the Brachyura, or Short-tailed Crustaceans (True Crabs) ; the Anomura (Hermit Crab, etc.) ; and the Macrura, or Long-tailed Crustaceans (Lobsters, Prawns, Shrimps, etc.).

In the family Cancridæ is the common Edible Crab (*Cancer pagurus*) that is so plentiful round our coasts. It belongs to the group of Stalk-eyed Crustaceans, so called because their eyes are set upon foot-stalks. There are five legs attached to each side, which are exclusive of the complicated apparatus of the mouth and jaw feet which guard its entrance. The two front large claws, or chelipeds, are developed into powerful pincers. The shelly armour, hard, strong, and unyielding, causes one to wonder how the creature's growth can continue during nearly the whole of its life. The answer to the problem is simply that the armour is shed annually, and while only covered by a soft skin the creature expands rapidly until a new coat is deposited. That the Crab can get rid of its carapace by a slit in some part of its body is understandable,

but how does it manage about its claws? As a preliminary step the hard, firm, muscular fibres which fill the claw and give it the well-known pinching power, become soft and watery, and thus can be drawn through the comparatively small openings by which the tendons pass from one joint to another. In the Edible Crab the flesh is quite unfit to eat during this process, being known as 'watery' crab. This crustacean is caught in various ways, but generally by means of baskets, called crab-pots, creels, etc. They have an aperture at the top through which the Crab gains access to the baited interior, but it is prevented from returning by an inverted cone of osiers, which allows downward, while it will not permit upward movement.

The shape of the carapace and claws of the Common Edible Crab are too well known to need description, but in the Swimming Crabs (Family: Portunidæ) is exhibited a marked difference in the hindmost pair of feet. They are flattened sideways, and have the last joint dilated into a thin, oblique plate, which answers as an oar or a fin, and enables the creature to propel itself through the water. The Common Green, or Shore, Crab (*Carcinus mænas*) belongs to this family, but its hindmost legs are less modified into paddles than in various other species. Owing to its diurnal habits, its fearless nature, and its love for shallow waters, the Green Crab is more easy to observe than many of our native crustaceans.



RIVER CRAB

The South European River Crab (*Thelphusa fluviatilis*) is a good representative of several freshwater species in the family Thelphusidæ, although some of its members lead terrestrial lives, and

in tropical regions even ascend mountains. The true Land Crabs, which are placed in the family Geocarcinidæ, migrate periodically to the sea, where the females lay their eggs. In the course of a journey these Crabs climb over all obstacles, from a hedge to a church or cliff, oblivious of the fact that a detour would, in the end, save time and call for less energy.

The Spider-Crabs (Family: Maiidæ) are marked by long and slender legs, such as are seen in the common Thornback Spider-Crab (*Maia squinado*), which is abundant on our coasts. It has a distinct beak, and its carapace is studded with spines or tubercles. It is a voracious scavenger, and consequently is a most useful inhabitant of the sea. The Giant Japanese Crab (*Macrocheira kaempferi*) is a member of the same family, and claims the distinction of being the largest of the whole Arthropoda. When its chelæ, or pincers, are outstretched, they measure eleven feet from tip to tip. Some of the Maiidæ often have sundry zoophytes growing on the carapace, almost completely hiding the animal. It is no mere chance result, but is the outcome of a desire for concealment. The Crab deliberately affixes small portions of weed or zoophyte to the carapace or limbs, which its spines make no difficult matter. In some cases, however, bivalves and barnacles affix themselves, and the Crab is forced to carry no inconsiderable load.

The family Ocypodidæ comprises the Swift-footed Crabs, some of which attain a speed exceeding that of a man. They are terrestrial to the extent of being unable to endure immersion longer than twenty-four hours. Closely related to them are the Calling-Crabs (*Gelasimus*), in which one of the pincers of the male often grows to an enormous size, while the other claw is quite small and feeble. At one time it was believed that this large claw enabled the Crab to put into effect specially marked pugnacious instincts, for which reason it was commonly called the 'Fighting Crab.' Later observations suggest that the male brandishes his highly coloured weapon to attract the female, and in any case it is a capital burrowing tool. The Calling-Crabs are very gregarious, frequently congregating in thousands on the seashore, or the borders of saltwater marshes. When the inhabitants of a crab warren are disturbed, they go scuttling over the ground to their homes, holding up their claws and beckoning in all directions in a most ludicrous manner.

The Hermit-Crab (*Pagurus bernhardus*) is the commonest British species in the Anomura group, the distinguishing feature in which is the small and feebly developed abdomen. It inhabits the shell of some mollusc, in which it can bury its unprotected tail, and into which it can retreat when threatened with danger. To see a Hermit-Crab fitting itself with a new shell is an interesting sight. The creature takes the shell among its feet, twirls it about with wonderful rapidity, balances it as if to try its weight, probes it with its long antennæ, and perhaps throws it away. When it is satisfied, it

whisks into its home with such speed that the eye can scarcely follow its movements.

The Northern Stone-Crab (*Lithodes maia*) approaches more nearly the typical form of the true Crabs. Its shelly covering is more calcified, but only three pairs of legs are shown behind the chelipeds,



STONE-CRAB

the fourth pair being folded up out of sight within the branchial chambers. The principal habitat of the species is the coasts of the North Pacific, but it is also found in the North Sea, where it frequents the northerly shores of the British Isles.

Another remarkable species is the Cocoanut Crab (*Birgus latro*), which is a land dweller with a hard, shelly abdomen, instead of being soft as in some species. This crustacean, notwithstanding doubts often expressed, is a tree-climber; and in the British Natural History Museum is exhibited a photograph showing a Robber-Crab, as it is also called, actually descending the trunk of a sago palm. It was long disbelieved that it was possible for this Crab to live largely on cocoanuts, the hard shells of which are covered with thick, fibrous husks. The crustacean, however, tears the husk, fibre by fibre, and exposes the eye-holes of the nut, which it hammers

with its heavy claws until an opening is effected, and it is able to extract the white albuminous substance.

In the group Macrura the chief tribe is the Astacidea, which includes the saltwater Lobster (Family : Homaridæ) and the freshwater Crayfish (Family : Astacidæ). In shape and appearance the Common Lobster (*Homarus gammarus*) differs considerably from the crab. It has the five pairs of locomotive limbs, but three pairs are chelate, or pincer-like. The front half of the body consists of a large shield or carapace ; the hinder half is made up of half a dozen segments, each furnished with a pair of swimmerets, and the tail is fan-shaped. The segmented portion of the body and the tail form the organ of propulsion in swimming. Nevertheless, the Lobster is not much of a rover, seldom straying far from the spot where it was hatched. The female lobster, like most crustaceans, carries her eggs attached to the under surface of the body, especially the swimmerets. Sometimes the eggs number as many as one hundred thousand, and there are seldom less than four thousand.

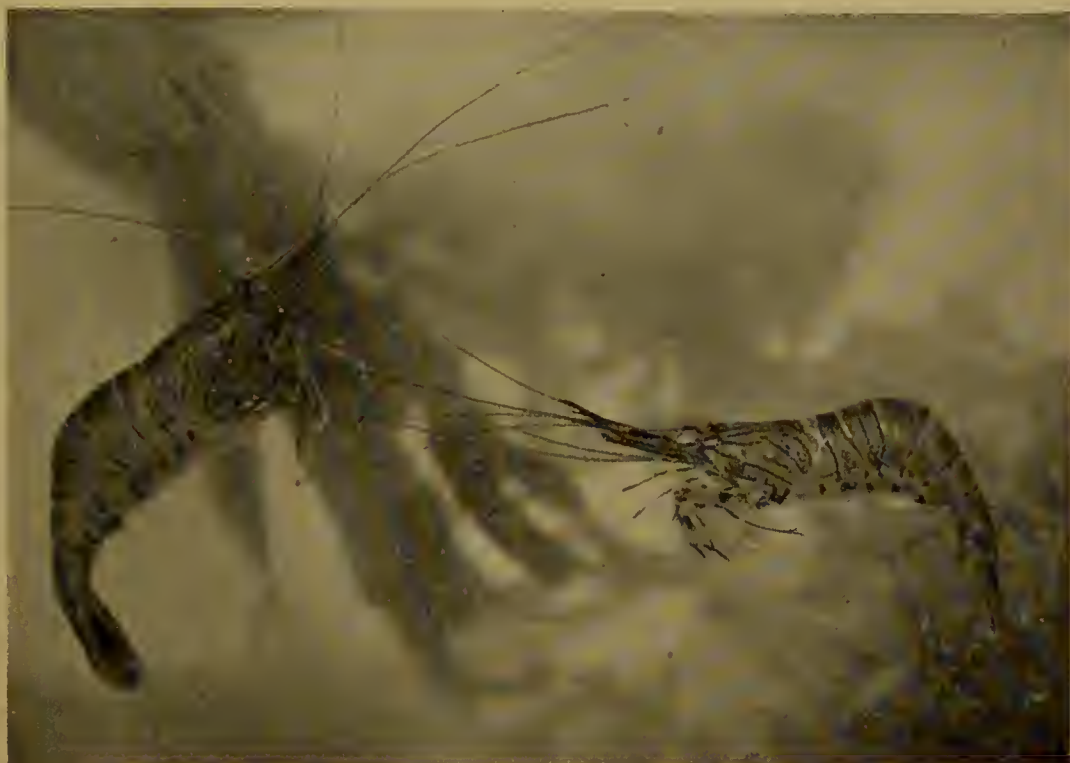
Most of the crustaceans are most combative animals, and the Lobster quarrels on the slightest pretext and fights most furiously. In these contests it often loses a claw or a leg, being obliged to discard entirely a wounded member. A fresh leg or claw sprouts from the scar, and it is to this circumstance that the frequently unequal size of lobster claws is owing. Lobsters, indeed, part with these valuable members with strange indifference, and will sometimes shake them off on hearing a sudden noise.

The Common Cray-fish (*Astacus fluviatilis*) of our rivers almost exactly resembles the marine lobster in appearance, and they have many habits and qualities in common. This creature mostly hides under stones, or in holes in the bank, from whence it issues in search of prey. It is particularly fond of dead fish and similar substances. The flesh of the Cray-fish is something like that of the lobster, but it is more delicate and less indigestible.

The Common Shrimp (*Crangon vulgaris*) and the Common Prawn (*Leander serratus*) belong to the families Crangonidæ and Palæmonidæ respectively. The Shrimp inhabits our shores in countless myriads. In every little pool that is left by the retiring tide they may be seen in profusion, betraying their presence by their quick, darting movements, flinging up a cloud of sand as they scuffle below its surface. The small Prawns are often confounded with the Shrimps, and popularly called by the same title. They can, however, be distinguished easily from each other, the beak of the Prawn being long and deeply saw-edged, while that of the Shrimp is quite short and smooth.

Belonging to the Sessile-eyed Crustaceans, so called because their eyes are seated directly upon the shell, is the Sand-hopper (*Talitrus saltator*), one of many species in the sub-order Gammaridea. This little crustacean, often called the Sand-skipper, is to be found

in great abundance all along our sandy shores, looking like a low mist edging the sea, so countless are their numbers. Wherever a bunch of blackened and rotting seaweed lies on the sand, there may be found the Sand-hoppers congregated beneath it, and literally boiling out when the seaweed is picked up. The leap of the Sand-hopper is produced by bending the body and then flinging it open with a sudden jerk. Its teeth are strong and sharp. It will eat almost anything. A swarm of these tiny creatures allowed to settle upon a handkerchief will bite it to rags, and when pressed by hunger they have no scruple in eating their own kind.



PRAWNS

Out of the large number of crustaceans that yet remain unmentioned, space only permits the inclusion of a couple of widely divergent species. The creatures popularly known as Barnacles were for a long time placed among the molluscs, on account of their shelly covering ; but modern naturalists refer them to the sub-class Cirripedia, because of the cirri or bristles with which their strangely transformed feet are fringed. When young, the Cirripedes are free and able to swim about, and are of a shape so totally different to that which they afterwards assume, that they would not be recognised except by a practised eye. In the adult state, they are affixed to some substance, being set directly upon it as in the case of the Acorn Barnacle (*Balanus balanoides*), which coats rocks and stones at the seaside. Another species (*Coronula diadema*) attaches itself

to the skin of whales and other cetaceans, turtles, etc., and a near relation actually burrows underneath the skin of the whale and penetrates to the blubber. The Goose-Barnacle (*Lepas anatifera*) clings to anything, whether still or moving, and in particular is the pest of ships on account of the pertinacity and the numbers in which it adheres to their bottoms. The submerged surface of a vessel in a very short time is coated so thickly with these cirripedes that her rate of speed is diminished markedly by the friction of their loose bodies against the water.

A totally different creature is the Wood-louse (*Porcellio scaber*), belonging to the sub-order Oniscoidea. It is very plentiful in all damp places, and especially delights in getting under logs of wood or decaying timber. In such localities their dead skeletons may be found often bleached to a porcelain-like whiteness. The Pill Wood-louse (*Armadillidium vulgare*) rolls itself into a globular shape if handled, when it might easily be mistaken for a bead or a berry.

CLASS : ARACHNIDA

THE SPIDERS AND SCORPIONS

Under the general term Arachnida are comprised the Spiders, Scorpions, and Mites, together with many lesser-known beings. They breathe atmospheric air, have no antennæ, and have four pairs of legs attached to the fore-parts of the body. They may be distinguished from the Insects by several peculiarities. In the first place they have more than six legs. There is no separate head; the head and thorax being fused, as it were, into one mass, the cephalothorax. In some of the higher Arachnida there is a bold division into thorax and abdomen, with the former portion of the body clearly divided into separate segments; but in many of the lower species there is not even a division between the thorax and abdomen, the whole body being merged into one uniform mass. They undergo no metamorphosis like that of the Insects, for, although the young Spiders moult their skins several times, there is no change of form.

ORDER : ARANEÆ

THE WEB-SPIDERS

Beginning with the true Spiders we find that their palpi (i.e. the jointed antennæ-like organs that project from the cephalothorax) are more or less thread-like, and in the males are swollen at the extremity into a remarkable structure, as indicative of the sex, as is the beard of a man or the curled tail feathers of a drake. In these strange creatures the mandibles are furnished with a curved claw perforated at the extremity, sometimes like the poison-fang of a venomous snake, and used for a similar purpose. The eyes

of Spiders are 'simple' and vary in number from one to six pairs according to the species. They all spin those remarkable nets which we popularly call 'webs,' and which differ wonderfully in the various species. The silky, filamentous substance issues from four or six spinning glands at the end of the abdomen, which are called spinnerets. In many instances the webs are employed as traps, wherein may be caught the prey on which a Spider feeds; but in other cases are only used as houses in which the creature can reside. Spiders are oviparous. For the protection of the eggs a cocoon is constructed. Sometimes the female ignores it completely when finished, suspending it in or near her home, but leaving the young ones to look after themselves. Other species, however, guard the eggs jealously. In some cases the mother encloses herself in the packet until the eggs hatch, while others carry the cocoon about with them.

In the family Agelenidæ we may pass by the Common House-Spider (*Tegenaria atrica*), with whose untidy webs we are familiar in dark corners, in order to note more closely a more interesting species. The Water Spider (*Argyroneta aquatica*) is really a terrestrial being, and needing to respire atmospheric air, yet it spends the greater part of its time submerged below the surface. The body of this Spider is profusely covered with hairs, which serve to entangle a comparatively large amount of atmospheric air, and it has the power of diving below the surface and carrying with it a very large bubble of air, that is held in its place by the hind legs. Stranger still, the young Water Spider is hatched under water, and lives there for some time before it ever sees the land. The female spins a dome-shaped cell, and from the surface of the water she fetches bubble after bubble of air, which she discharges into the cell until it is filled with air like a diving-bell. Here the mother lives, deposits and hatches her eggs without even wetting them. The Water Spider makes an interesting inhabitant of an aquarium. The vessel should contain a water plant of some kind. The Spider's curious habits are easy of observation. It should be supplied liberally with flies and other insects; it will pounce upon them, carry them to its house, and there devour them.

The Cross, or Garden, Spider (*Araneus diadema*) is a member of the family Argiopidæ (*Epeiridæ*), and is one of the best examples of the whole order Araneæ. It is found in great numbers in our gardens, stretching its beautiful webs perpendicularly from branch to branch, and remaining in the centre with its head downwards, waiting for its prey. The web is composed of two different kinds of threads. The radiating and supporting strands are strong and of simple texture; but the fine spiral thread which divides the web into a series of steps, decreasing in breadth towards the centre, is studded with an immense number of microscopic globules, which give to the web its peculiar adhesiveness. In an ordinary web there may

be as many as eighty thousand of these globules loosely strung upon the lines.

The Wolf-Spiders (Family: Lycosidæ) are all ground dwellers, and take their prey in fair chase instead of catching it in nets. They are fierce and determined hunters. Some are semi-aquatic in habit, and are not only able to run fearlessly upon the surface of the water, but can descend along the aquatic plants until they are deeply immersed, breathing the air which is entangled among the hairy clothing of their bodies. In this family the females carry their packet of eggs until the young are hatched. On leaving their shelter the young spiders attach themselves by threads to the back of the mother, who carries them about for several days. To various Wolf-Spiders the name "Tarantula" is often mistakenly applied, notably to a West Indian species (*Psalmopæus cambridgi*), which is frequently brought to this country concealed in bunches of bananas. The true Tarantula is the Italian species (*Lycosa tarantula*). In some parts of Southern Europe the peasantry dread this creature, believing that its bite is poisonous, and giving rise to a kind of epileptic disease, whereas the Spider is harmless to man, however formidable it may be to the insects upon which it preys.

All Spiders are carnivorous, the size of the prey depending upon the dimensions of the destroyer. It might be expected that a



BIRD-EATING SPIDER

Spider, with a spread of limb equal to that of the open human hand, would be able to suck the juices of something bigger and stronger than mere insects. Various large, hairy spiders prey upon the more helpless vertebrates, quite easily overcoming lizards and small birds. They are natives of tropical and sub-tropical regions, the largest occurring in Central America.

The Bird-eating Spiders are generally known under their tribal name 'Mygale.' They spin no web, but live in holes in the ground, or in silken

tubes which are constructed chiefly in the hollows of trees. A great part of their food consists of beetles, etc., but at night they will climb trees and prey upon the young of the humming-birds, and even the mother bird will not escape if the Spider gets her in its clutches. Two of the best-known species are the Bird-catching Spider (*Mygale avicularia*) and the Banded Bird-eating Spider (*Psecilotheria fasciata*).

The Trap-door Spiders (Family: Ctenizidæ) are found in the south of Europe, South Africa, Central and South America, and other regions. All of them dig burrows in the earth which they line with a silken web, and to the tube they make a trap-door with a hinge, that permits it to be opened and closed with admirable accuracy. The door is circular and is made of alternate layers of earth and web. It is a strange sight to see the earth open, a little lid raised, some hairy legs protrude, and gradually the whole form of a Spider show itself.



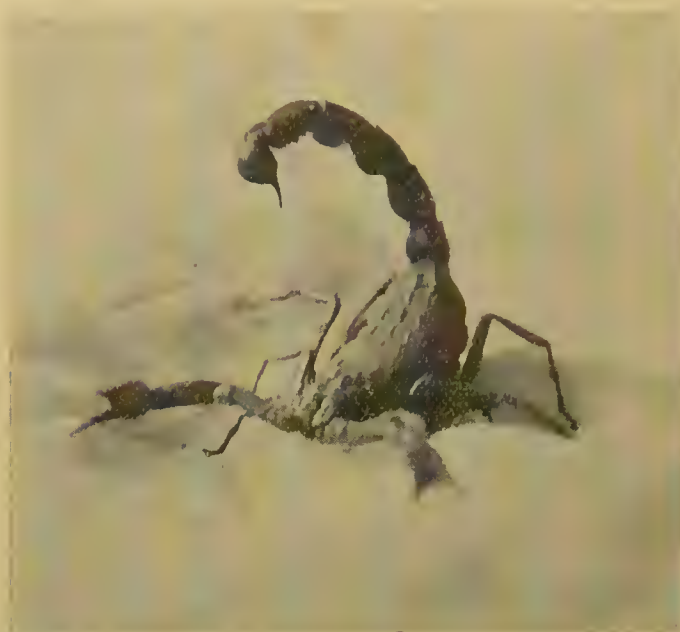
TRAP-DOOR SPIDER'S NEST

ORDER: SCORPIONES

THE SCORPIONS

Of all the Spider race the Scorpions are most justly dreaded. These really terrible beings are at once recognised by their large claws, and the armed tail. This member is composed of half a dozen joints, the last being arched and pointed, very sharp, and communicating with two poison glands in the base of the joint. With this weapon the Scorpion wounds its foes, striking smartly at them, and by the same movement driving some of the poison into the wound. The effect of the poison is very variable, depending not only upon the size and health of the Scorpion, but also the constitution of the person who is stung. Generally, however, there is little danger to life, though the pain is most severe and the health much impaired for a time, the whole limb throbbing with shooting pains and the stomach oppressed with overpowering nausea. The eyes of the Scorpions differ in number, some species having twelve,

others eight, and some only six. The Spanish Scorpion (*Buthus europæus*) digs a shallow pit in the sand, where it hides while on the look out for prey. Though one of the small species, it is typical



SPANISH SCORPION

of the whole order. The Rock Scorpion (*B. afer*) of Africa is a larger creature, measuring about six inches in length when fully grown.

The Scorpions inhabit most warm countries, and everywhere are held in the greatest detestation. They are very fond of warmth and afraid of light, and therefore crawl into houses and conceal themselves in the warmest and darkest spots that can be found. No careful

person thinks of thrusting his hand under a pillow, or his foot into a shoe, without ascertaining that no Scorpion has taken up its abode there. They are fierce and rapid creatures, perfectly aware of the terrible weapons with which they are armed. When threatened or alarmed, the Scorpion curls its tail over its body, flourishes the venomous weapon menacingly, and if it cannot escape conveniently, boldly rushes to the attack. However repulsive in appearance and venomous in action, it may excite some admiration for its attachment to its young. While they are yet small and feeble, they congregate upon the person of the mother, swarming over her back, her forceps, her limbs, and even clinging to her tail, and exist in such numbers that they quite conceal the outline of their parent. Like the other Arachnida, the Scorpions are carnivorous, and feed upon various living creatures, such as insects and the smaller crustacea. They mostly seize their prey in their claws, and then wound it with the sting before attempting to eat it. Even the hard-mailed ground-beetles fall victims to this dread weapon.

ORDER: ACARI

THE MITES AND TICKS

None of the Mites attain large dimensions, and the greater number of them are almost microscopic in their minuteness. The Mites are found everywhere, in the earth, in trees, in houses,

beneath the water, and parasitic upon animals. They swarm upon our provisions—cheese, ham, bacon, and biscuits are equally covered with these infinitely tiny but potent destroyers, and even flour stores are ravaged by countless millions of Mites that assail the white treasure.

One of the most annoying species is the Harvest-Bug (Family : Trombidiidæ) whose six-legged larvæ cause irritation in autumn by burrowing under the skin. This little pest of our fields and gardens is very small and of a dull red colour, looking exactly like a grain of cayenne pepper as it glides across a leaf. In some places it swarms to such an extent that the leaves are actually reddened by their numbers. While walking through the stubble fields, the Harvest-Bug is terribly apt to make successful attacks upon one's ankles, and in the case of persons endowed with a very tender skin almost drives the sufferer to the verge of madness. The pest does not confine its attacks to human beings, but equally infests horses, dogs, sheep, and rabbits. One little Red Mite (*Tetranychus telarius*), better known as the money-spider, is one of certain species called Spinning-Mites, which cause much damage to vegetation. Various mud and water Mites, while in the larval stage, adhere to water-insects, and others live in the shells of freshwater mussels. The Cheese-Mite (*Tyroglyphus siro*) is a familiar form that well repays examination under the microscope. It is also found in flour and various kinds of meal. It travels over loose flour with astonishing speed. Despite the minute size of these Mites, their structure is not a jot less complicated than that of larger beings. For example, the body is covered with numerous stout hairs which are capable of movement, and consequently each separate hair must have attached to it at least two muscles with their tendons. A great number of Mites live parasitically upon birds and mammals. Bats, poultry, cage-birds, pigeons, sheep, and various other animals suffer from what is generally their own particular parasite. The Itch-Mite (*Sarcoptes scabiei*) attacks human beings and causes the disease known as scabies. The Mite tunnels under the skin, where it lays and hatches its eggs, when the young Mites in their turn commence burrowing operations. When once the skin is infested, it is most difficult to eradicate the irritating pest.

The Ticks belong to the family Ixodidæ ; they are most troublesome beings that attach themselves to many terrestrial vertebrates, mammals, birds, and reptiles. Even the thick hides of the rhinoceros and other pachyderms are not proof against the cylindrical beaks with which the Ticks make their punctures, from which to pump themselves full of blood. One of the most important members of the family is the Cattle-Tick (*Margaropus annulatus*), which on account of its numbers often produces very serious effects upon the animals which are attacked. This species has been proved to be the carrier of Texas fever.

CLASS: CHILOPODA

THE CENTIPEDES

In the Centipedes the body is formed of a number of similar segments, each of which, with the exception of the last, is furnished with a pair of feet. The Centipedes and Millipedes are sometimes included in the class Myriopoda, popularly called 'Hundred-legs,' although the scientific title signifies ten thousand feet. The creatures, however, differ essentially from each other, and it is better to refer them to different classes. The typical order of the Chilopoda is the Scolopendromorpha, containing numerous species, which generally carry from twenty-one to twenty-three pairs of legs. The young are born alive, and at birth possess the same number of segments as the parents.

Most of the larger Centipedes are inhabitants of the warmer regions, and many of them attain almost a foot in length. They prey chiefly upon insects, but small lizards and mice often fall victims. They are not only unpleasant and repulsive to the sight, but are really formidable creatures, being armed with fangs scarcely less terrible than the sting of a scorpion. These weapons are placed just below the mouth and are formed from the second pair of feet, which are modified into a pair of strong claws and terminated by a sharp hook on each side. The hooks are perforated, and are traversed by a little channel leading from a poison gland, like that of the scorpion, so that the venomous secretion is forced into the wound by the very action of biting. It is believed that the claws of the legs are also poisonous, for if some species merely crawl over the human skin, a trail of inflammation results. The largest known Centipede (*Scolopendra gigas*) is a native of the West Indies and South America; it measures twelve inches in length. In this order there is only one British species (*Cryptops hortensis*) which is often found in our gardens.

In the order Geophilomorpha the body is long and thin, sometimes consisting of as many as a hundred and forty segments. They have no eyes. They are furnished with poison glands, but their jaws are not sufficiently strong to pierce the human skin. They are subterranean beings, and exist chiefly upon earthworms. There are several species of British Geophilids, some of which are from two to three inches in length, and with about fifty pairs of legs. Very often they are found within very ripe peaches, apricots, plums, etc., lying comfortably coiled up between the stone and the fruit. Many of these small Centipedes exude an offensive fluid, which is probably used as a means of defence against their natural enemies. In some instances the fluid is phosphorescent, as in the species *Geophilus electricus*, which is fairly common in Cambridgeshire and Epping Forest. The light is very conspicuous after

dark, and not infrequently causes the creature to be mistaken for a glow-worm.

Still other species are comprised in the order Lithobiomorpha. They are short in the body, and bear only fifteen pairs of legs. When the young are hatched, they possess but seven pairs of legs, the full complement being approached during the course of successive moults. There are numerous species, of which the *Lithobius* are best known. Unlike the more typical and ferocious family Scolopendridæ, the largest of them are found in the temperate regions of the Northern Hemisphere, but none of them exceed two inches in length. Quite half a dozen species are natives of Britain, one of the largest and commonest being *Lithobius forficatus*.

CLASS : DIPLOPODA

THE MILLIPEDES

The Diplopoda, or Millipedes, are easily distinguished from the centipedes by their rounder bodies and the double pair of legs on each segment ; and whereas the centipedes are swift, ferocious, and carnivorous, the Millipedes, with few exceptions, are slow and vegetable feeders, and are unarmed, save for the possession of



RED-LEGGED MILLIPEDES

offensive liquid glands. Like the centipedes these creatures lurk under stones, beneath the bark of trees, etc. The members of one family, the Glomeridæ, are called Pill-Millipedes, because their bodies, consisting of only a dozen segments, can be rolled up after the manner of some of the wood-lice. A British example is a dark-coloured Millipede (*Glomeris marginata*). It feeds on decaying animal and vegetable matter. A common Millipede of our gardens

is the species *Iulus sabulosus*, about an inch in length. Its movements are very curious. The little delicate feet, looking like white threads, move in a regularly graduated order, so that, as the creature glides along, a succession of waves seem to pass over its body. On being touched, it immediately stops and coils itself into a spiral form, lying necessarily on its side. The development of the creature is interesting. In the early part of the spring the female deposits sixty or seventy eggs in the earth, digging a hole expressly for their reception. In about three weeks the young are hatched, without any limbs, and retaining the two halves of the egg-shell by means of a filament, which fastens them to the body. After a little while they gain three pairs of feet, and are able to separate themselves from the shell. As they continue to grow, the number of segments and limbs increases, so that the young Millipedes gradually lose their resemblance to beetle larvæ, and attain the shape and form of their parents. The accompanying photograph shows the Red-legged Millipede of South Africa.

SUB-KINGDOM : VERMES

THE WORM-LIKE INVERTEBRATES

In this sub-kingdom is a considerable number of species difficult to describe by means of common characteristics, but the earthworm and leech are typical representatives of two important classes, namely the Annelida (Bristle-worms) and the Hirudinea (Leeches).

The well-known Common Earthworm (*Lumbricus agricola*) is formed of rings or annuli, ending in a pointed head and a tapering tail. It is without feet, but upon each ring or segment are four pairs of minute bristles to assist progression, forming eight longitudinal rows, which enable the creature to take a firm hold of the ground as it proceeds. The bristles are used by the worm in practically the same manner as the snake utilises the edges of its belly scales. When the worm wishes to advance, it hitches the bristles against the ground, and then, contracting its rings, brings itself forward. In a full-grown Earthworm are at least one hundred and twenty rings, so that the full complement of bristles amounts to nearly a thousand, which afford their owner a very strong hold on the ground. The creature is eyeless and it has no gills, appearing to breathe through the whole of its skin. It is almost nocturnal, and is a vegetable feeder.

Darwin's experiments proved that the Earthworm is a great fertiliser. Spreading a quantity of chalk over a field, the patient scientist found that by the end of twenty-nine years the chalk was seven inches below the surface, thus measuring the quantity of earth brought to the surface by worms in that period. In various parts of the world are allied species much larger than the Common

Earthworm, some attaining a length of five feet and a circumference of a man's finger.

The Lug-worm (*Arenicola piscatorum*), or Sand-worm, usually measures eight inches in length. Its colour depends upon its environment, being light or dark according to whether it lives in sand or black slime. Unlike the preceding species, the Lug-worm is not bristled uniformly from end to end, the central segments possessing bristles in clusters. The creature burrows in a manner entirely different from that of the earthworm, actually swallowing the sand in front of it, and passing it through its intestinal canal. The Lug-worm is found on all the coasts of Europe, and is a popular fishing-bait. The species is of remarkable fecundity and rapid growth, and the same stretch of ground will afford a supply of bait that appears to be inexhaustible.

The Common Leech (*Hirudo medicinalis*) is an aquatic creature that differs considerably from the typical worms, for it has no bristles, and each end of its body is furnished with a cup-like sucker. It progresses by fixing the suckers alternately to any object, and then bending the body like a bow to bring forward the hinder sucker before releasing the one in front, preparatory to fixing it a little distance ahead. It can also swim with a sinuous, but not rapid motion. The mouth sucker is provided with horny saws, their edges meeting in the centre and capable of being worked backwards and forwards. Formerly the Leech was used largely in surgery for the purpose of blood-letting. The blood, which the creature sucks, passes into a number of chambers, and as the body is exceedingly dilatable it can expand to three times its ordinary size. But whatever store of liquid food the Leech may take into its stomach sacs, it digests it only at a rate sufficient to maintain life in comfort. The natural food of the Leech is the blood of fishes, frogs, mammals, etc. In colour it is black, with bands of lighter shades, but another species, the Horse Leech (*Aulostoma gulo*), is of a blackish-green colour. Astounding stories are current concerning the voracity of this invertebrate, it often being believed that even a few of them are capable of bleeding a horse to death. Earthworms, snails, freshwater mussels, and vegetable algæ, form the major part of its food.

Placed in a distinct class (Nemathelminthes), there are many parasitic worms that infest the digestive organs of all classes of living creatures, not even excepting man. One particularly dangerous parasite is the Trichinosis Worm (*Trichina spiralis*). This creature exists in the intestines of numerous mammals and birds. When the minute worms are born, they are carried by the blood to different parts of the body, and finally take up their residence in the muscular fibres, where they undergo the earlier stages of growth. But full development can only take place in the intestine of an animal

other than where they were born. If the muscles of a pig be infested with immature Trichinosis Worms, there is danger to the person who partakes of the pork when the pig is killed. Imperfect cooking will fail to destroy the young parasites, which, in due course, are transferred to a human host, to whom they will certainly cause sickness and, in all probability, death.

SUB-KINGDOM : ECHINODERMATA

THE HEDGEHOG-SKINNED INVERTEBRATES

This small division gains its name from the fact that the skins of its members are furnished, to a greater or lesser extent, with spines resembling those of a hedgehog. They are devoid of legs, and their parts radiate from a common centre, although in some species this formation is not visible externally. It must be noted, however, that other creatures, such as the jelly-fish and sea-anemones, are also of radiate form, and at one time they were classed with the Echinoderms under the title of Radiata. The walking apparatus of the Echinoderms is among the most remarkable of the whole animal world. It consists of an immense number of tiny tentacles, each with a little transparent head, which acts as a sucker when applied to any hard substance. The suckers continuously advance, take hold, and draw the body gently forward. In the Common Star-fish there are nearly two thousand suckers, which afford a regular gliding motion that seems to be almost involuntary. The



SEA-URCHIN

Echinoderms feed largely upon molluscs. They are very widely distributed, ranging all marine waters between the regions of ice and the Equator, from the beach to mid-ocean, from the surface to the lowest depths. The chief classes are the Echinoidea (Sea - Urchins), Asteroidea (Star-fish) and Holothuroidea (Sea - cucumbers).

The Sea - Urchin (*Echinus sphaera*), or Sea-Egg, is a curious

being protected by a shell, generally dome-shaped, but extremely variable in form. This covering consists of a number of slightly curved pieces, hexagonal or pentagonal in shape; and the mechanical difficulty of increasing the size of the shell with the age of the animal is overcome in a marvellous manner. As the Urchin grows, new chalky matter is deposited upon the edges of each plate, and thus the dimensions of the whole shell increase while the globular form is retained. The surface of the shell is thickly covered with short, sharp spines that are remarkable in structure, each spine being movable at the will of the creature as in the case of the hedgehog. The Sea-Urchin is used as food in many parts of the world. It is often eaten raw, being cut into quarters and the flesh scraped out with a spoon.

The Common Star-fish, or Cross-fish (*Uraster rubens*), is a characteristic example of an order to which might be devoted as many pages as it is proposed to allow words. When one picks up a Star-fish cast on the sea-shore, it appears to be as innoxious a creature as it is possible to find, yet it is a terrible enemy to molluscs. Although its body is rather soft, only having chalky particles embedded in the integument, it can devour bivalves, however closely they may close their shells. Fishermen simply detest it, for though it has no definable eyes or organs of scent and hearing, it detects and despoils a baited hook readily enough. Fishermen, in reprisal, often tear the Star-fish across and fling the pieces into

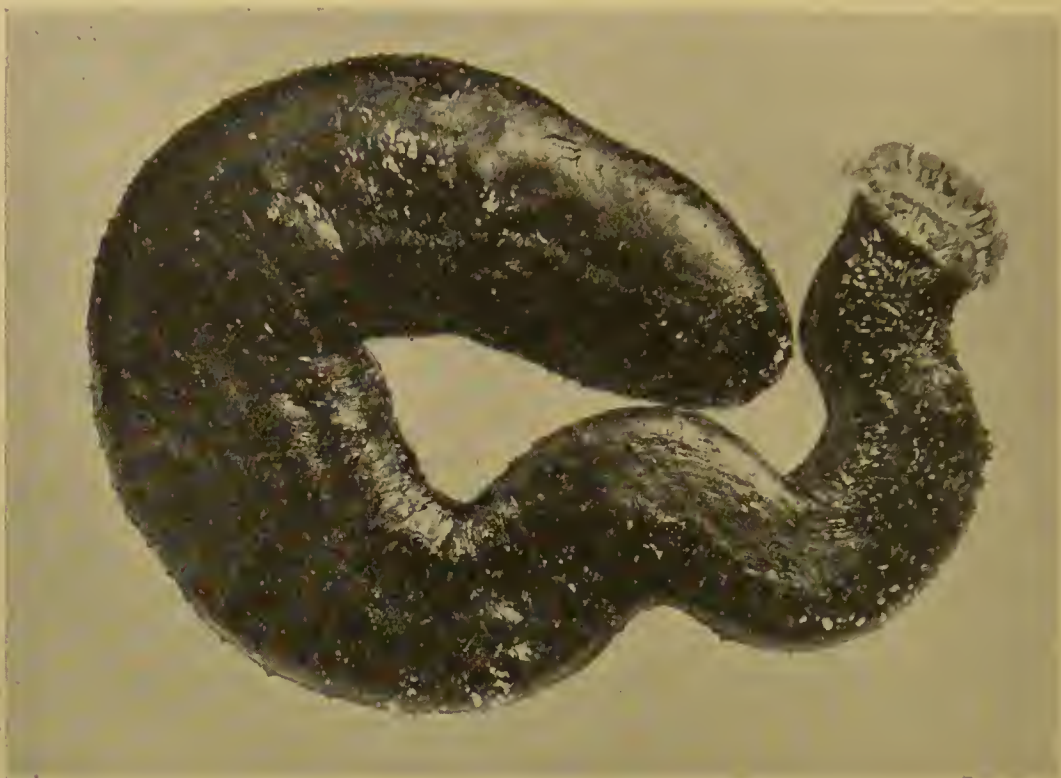


STAR-FISH

the sea. This apparently drastic measure, however, does not kill the Star-fish. The two halves heal their respective wounds, put out fresh rays, and after a time become two perfect Star-fishes. More than this, a single detached ray will grow the body and the remaining four arms.

The Sea-Cucumber (*Holothuria edulis*) is the Trepang or Bêche-de-Mer, a delicacy of the Chinese table. It is a cylindrical, worm-like

creature about two feet in length, with a leathery covering in which is a small proportion of calcareous matter. This species is found chiefly in the Malayan seas and off the north-east coast of



SEA-CUCUMBER, OR BÊCHE-DE-MER

Australia, especially along the Great Barrier Reef. The Sea-Cucumber is caught by divers, or it is impaled on long pointed sticks. When dried and smoked, which processes reduce them to half their original length, the Bêches-de-Mer, of which there are several dozen varieties, realise as much as £150 per ton.

SUB-KINGDOM : CŒLEENTERATA

THE JELLY-FISH, SEA-ANEMONES AND CORALS

The Cœlenterates comprise numerous curious and interesting animals. Structurally they are radiates, the rays being a multiple of four or six, and not five as in the Echinoderms. There are various systems of classification in the lower divisions of animal life, which in most cases are based upon highly technical considerations that must perforce be ignored in the few pages that can be devoted to them.

The Cœlenterates are divided into two main classes, viz. the Jelly-fish (Polypomedusæ) and the Sea-anemones and Corals (Anthozoa). These two classes comprise the Stinging Cœlenterates,

so called because their skin is furnished with a number of minute capsules, from each of which can be projected a long, hollow, and pointed filament, which is well beset with barbed hooks. These tube filaments, which are adhesive or penetrative, eject a poisonous substance where the point inflicts a wound. The whole history of these animals is peculiar in the extreme. They exhibit some of the most graceful shapes and pleasing hues that can add beauty to a living being, but they also afford examples of the earlier forms of organs and members which in the higher animal attain their fullest development. The function of nutrition is carried on in these animals by a method exceedingly simple. They are furnished with a cavity, corresponding to the stomach of higher animals, in which the food is placed, and from which a number of diverging vessels convey the nutritive fluid to the rest of the body.

In the order Siphonophora is the celebrated Portuguese Man-of-War (*Physalia utriculus*), which is a native of all the tropical seas. It belongs to the group of Jelly-fish whose structure is entirely gelatinous, mostly clear and transparent, but sometimes semi-opaque, or coloured with most beautiful tints. The general shape of this remarkable being is a bubble-like envelope filled with air, upon which is a membranous crest, and which has a number of tentacles hanging from one end. These appendages are armed with formidable stinging processes, too minute to be seen with the naked eye, but possessing venomous powers even more noxious than those of the common nettle. The colours of the *Physalia* are always beautiful, and slightly variable, both in tint and intensity. The delicate pink crest can be elevated or depressed at will, and is beautifully transparent. The general hue of its body is blue, a very deep tint at the pointed end, and fading into softer hue towards the tentacles. A general iridescence, however, plays over the body, which seems in certain lights to be formed of topaz, sapphire, or aquamarine. The short fringes are beautifully coloured, the inner row being deep purple, and the outer row glowing crimson, as if formed of living carbuncle.

The distinguishing feature of the order Scyphomedusæ is a large umbrella-like disc, by means of which the creatures are able to proceed through the water. The Common Blue Jelly-fish (*Aurelia aurita*), which is plentiful in our own seas, is typical of many species. The greater part of the creature consists of the umbrella, the margin of which is scalloped all round. From this fringe of lobes are suspended long, delicate cilia, or extensible filaments. On the underside, and in the centre of the disc, lies the mouth, together with various processes that aid in the capture of the prey, which consists chiefly of small crustaceans and various other marine creatures. There are few more beautiful sights than to stand on a pier-head or lie in a boat and watch the Medusæ passing in shoals through the clear water, pulsating as if the whole being were

but a translucent heart, trailing their streaming cilia behind them, and rolling gently over as if in excess of happiness. At night the Medusæ put on new beauties, glowing with phosphorescent light like marine fire-flies, and giving to the ocean an almost unearthly beauty that irresistibly recalls to the mind the "sea of glass mingled with fire."

Our common Hydra, or Freshwater Polyp, is a representative of the order Hydromedusæ. The young are sometimes developed from eggs, but oftener by means of buds, which grow out of the parent's body. This method of multiplication is common to many of the Jelly-fish, some of which far exceed our native specimens in size and the brilliancy of their colouring. All of the Medusæ,



BEADLET ANEMONE

however, may be considered as being little more than a mass of animated sea-water. If a fairly large Jelly-fish be laid upon a piece of blotting paper, it will evaporate, and leave scarcely more than its outline on the paper.

We now come to the polyps that are not free swimmers, but occupy permanently fixed situations. The Sea-Anemones bear a singular resemblance to vegetable forms. Their substance is always gelatinous and fleshy, and round the entrance to the stomach are set certain tentacles used in catching prey and conveying it to the digestive organs. These tentacles are armed with myriads of offensive weapons contained in little capsules, and capable of being discharged with great force. When the victim has been sucked down into the stomach, the lips close over it; and

a day or two later the undigested remains are discharged by the same orifice as that by which the food was taken in.

Notwithstanding their common name, these Coelenterates resemble the chrysanthemum, daisy, or dandelion rather than the simple-petalled anemone. Many of the flower-like animals vie with the gaudiest blossoms of the field or forest in the variety and richness of their hues. As they cling to rocks they may appear like mere lumps of vari-coloured jelly when the tide is out; but when the water returns to them they vivify and expand into strange and lovely beings that fill the observer with wonder and delight.

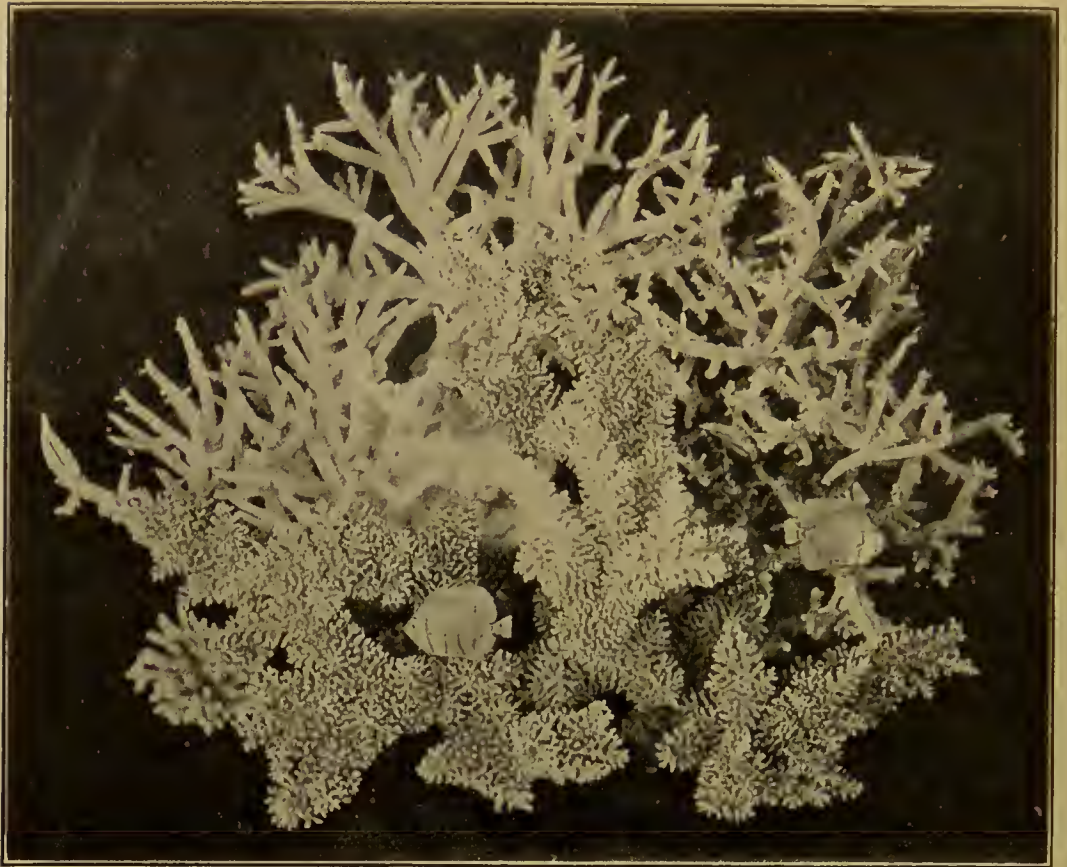
The most common of the Anemones on the British coasts is the well-known Beadlet (*Actinia mesembryanthemum*), with its circlet of pearl-like beads at the base of its tentacles. It is a very hardy species, living mostly on the rocks that lie between high and low-water mark. It is perhaps more variable in colour than any of the British Actinæ, taking all imaginable hues, graduating from scarlet to crimson, from crimson to orange, and from orange to yellow or green. Our finest native species is the Plumose Anemone (*A. dianthus*), with its cylindrical stem and beautiful tufted and fringed tentacles. It can separate itself into several parts, each of which becomes an independent being. Its colours range from snowy white to bright red. Some tropical Anemones are two feet across.

The Corals really only differ from the anemones in the possession of a calcareous skeleton, and practically some species may be described as anemones, which have the power of encrusting their bodies in stone. Other kinds of Coral polyps live only in colonies. A polyp, just in the same manner as a plant, throws out a bud, which in due course takes on the shape of the parent, and in its turn gives birth to a new bud. This process is repeated again and again, until it results in a tree or bush of polyps, all connected by a cord of animal matter, which passes from one polyp to another inside the carbonate of lime skeleton.

Red Coral (*Corallium rubrum*) is beautifully red and very hard, and can be made into a variety of ornamental articles such as bracelets, necklaces, rings, etc., and in regions where good Coral exists, it becomes an important article of commerce, as in the Red Sea, Persian Gulf, and off the coasts of various Mediterranean countries and islands. In the photograph is shown a specimen of Stag's-horn Coral (*Millepora alcicornis*), which belongs to the group scientifically known as the coral-like Hydrozoa. In some parts of the world, particularly along the Great Barrier Reef, Australia, this Coral is found in great profusion over unbroken areas many acres in extent. It is a matter of extreme difficulty to identify pieces of Coral, for not only are there a great many different kinds, but in the same species astonishing divergences are often exhibited.

In exactly the same manner as these beautiful Coral branches are formed, other polyps, by working generation after generation,

form huge masses of calcareous matter, that may, in the course of ages, rise to the surface of the sea in the shape of reefs and islands. Thus these lowly animals are constantly adding to the outer crust of the earth.



STAG'S-HORN CORAL

SUB-KINGDOM : PORIFERA

THE SPONGES

The light, porous, and elastic Sponge, that we find invaluable for washing and cleansing purposes, commences life as a small gelatinous bag possessing the power of swimming. It moves about and finally fixes itself to a rock, stick, shell, or other substance. By an internal secretion of its own it grows into a mass, which is covered with a jelly-like envelope, furnished with pores that can suck in water, from which to extract oxygen and minute forms of nutriment, after which the water is expelled through larger orifices as though from a fountain. In this manner the Sponge, which cannot roam in search of food, causes currents to set in towards it, thus providing it with a constant supply of food.

No one can form an adequate idea of the living Sponge from the dry, dead skeleton which is sold under that name. Many of the

species are decked with beautiful colours, while all are truly beautiful creatures when viewed in full life and action. They are to be found widely distributed through the seas, and there is hardly a solid body on which a sponge will not grow. They are generally found hanging from the undersides of projecting rocks at some distance below the surface of the sea, or clinging to the roofs of submarine caverns. Some, however, are strong, sturdy, and branched, and stand boldly erect, like the earth plants, which they so wonderfully resemble. Even the living inhabitants of the sea are liable to become the resting-places of many a Sponge, and the crustacea are often forced to bear on their shells the additional burden of living Sponges more massive than their whole body.

The true living being which constitutes the Sponge is of a soft and jelly-like texture to the unaided eye, and with the aid of the microscope is found to consist of an aggregation of separate bodies, some of which are furnished with long cilia. A Sponge in full action is a wonderful sight, the movements of the cilia driving the water through the innumerable pores, whirling along all kinds of solid particles, arresting those which are useful for digestion, and rejecting those which it cannot assimilate. A



By permission of the trustees of the British Natural History Museum

LYSSACINE SPONGE

creature thus composed will stand in need of some solid framework on which the delicate fabric can be supported, and under the

microscope we find that it is composed mostly of a fibrous and rather horny network, strengthened with variably-shaped spiculæ of a hard mineral substance.

Sponges occur in all seas between the equator and the poles, but only attain their greatest size and perfection in the warmer regions. There are various species found round the British coasts, but they are not of any economic importance. Commercial Sponges are obtained chiefly in the Eastern Mediterranean and the West Indies. The Turkey Sponge (*Spongia officinalis*) has a cup-shaped body which, owing to the smallness of its tubes and orifices, is very durable and not easily torn. It is rather difficult to believe that a soft toilet Sponge was once a dark fleshy mass that cuts not unlike raw meat. The Common Bath Sponge (*Hippospongia equina*), or Horse Sponge, has wider channels, and the separating walls are of thin texture. Very large specimens are obtained off the coast of Florida and the Bahama Islands, and one will easily absorb a pailful of water.



By permission of the Trustees of the British Natural History Museum

EUPLECTELLID SPONGE

There are several thousands of species of Sponge, varying in size from a pin's head and a grain in weight, to masses that scale over a hundred pounds. Some are leathery in substance, some are almost of stony material, and not a few may be taken easily for spun glass. They are of infinite shapes, cups, vases, tubes, and spheres being quite common, and some are so branched that one can scarcely realise that they are animals, and not vegetable growths.

The two photographs show specimens that differ widely from the Sponges in common use. Notwithstanding their apparent dissimilarity, both of them are members of the Six-ray, or Glass, Sponge Group. The Lyssacine Sponge (*Rhabdocalyptus victor*) "forms a deep, thin-walled vase of felt-like texture." The Euplectellid Sponge (*Walteria leuckarti*) "consists of a long, hollow, thick-walled tube rising from a solid base, and with solid pinnate branches arising from the tube at right angles."

SUB-KINGDOM : PROTOZOA

THE SIMPLEST ANIMALS

At the bottom of the scale of animal life are the Animalcules, creatures of most minute proportions that in most cases are invisible to the naked eye. They are of the very simplest organisation, being composed of but one cell. It was in 1755 that a German scientist discovered the Proteus Animalcule (*Amœba proteus*) in a glass of water. In appearance it is a minute speck of jelly, only one-hundredth of an inch in diameter. Really it has no outline and no shape, for its body is continually altering its figure, so that the rounded object which was seen in the microscope but a few minutes before, will, in that short space of time, have protruded a number of elongations that look like the fingers of a glove or the rays of a star-fish. It has no particular stomach, but extemporises that organ out of any part of its body with which its food happens to come in contact, literally pushing the food into its body, and then digesting it without requiring any special apparatus for the purpose.

Many gelatinous Animalcules are quite devoid of any covering; others are enclosed in a horny case, pierced with openings, through which the filaments can be projected; while a great number of species are furnished with shells composed of carbonate of lime, very similar in form to those of the molluscs.

In the Foraminifera the pretty microscopic shells are pierced; sometimes the shell is lacking, its place being taken by a cover of matted sand-grains. These tiny beings, existing in numbers that are rivalled only by the sands of the sea for multitude, play no unimportant part in forming the chalks and limestones that compose great portions of the earth's crust. The bed of the ocean is covered

with an ooze that consists largely of the skeletons of Foraminifera. Geology teaches us that not for ever do these animal remains lie submerged fathoms deep. The chalk cliffs of Dover are composed largely of the microscopic shells, and traces of Foraminifera in the Himalaya at a height of twenty thousand feet bear witness to the gradual elevation of the ocean floor during the passage of countless ages, which results in the marine ooze finding a resting-place high up among the clouds, and at least five hundred miles from the sea-shore.

Another class of Animalcules, the Infusoria, comprises various species of tiny animal specks, of which the Phosphorescent Animalcule (*Noctiluca*) is the best-known, for it swarms in the sea, especially in the warmer portions, and is remarkable for its luminous power. If a vessel be filled with sea-water and brought into a dark room, the *Noctiluca* fill it with little sparklets of bluish light that shine for an instant, and which can be induced to give out their momentary radiance by tapping the vessel, or even by a heavy footfall on the floor of the room. Each of these little beings is furnished with a minute tail-like appendage, by means of which it is enabled to proceed through the water, and when the conditions are favourable, they fill the sea with their luminous hosts, and cause each wave to become a breaking mass of liquid fire. A ship passing through the sea leaves a fiery wake behind her keel, and when the boatmen lift their oars from the water, they appear to drop flames from the blades as they are raised, all dripping, into the air at every stroke. Although infinitely tiny in their dimensions, they are yet large enough to be discerned by the unaided eye, and can therefore be isolated without difficulty and placed in the field of the microscope.

Reference was made in earlier pages to the propagation of disease by means of mosquito bites. The blood of patients suffering from malarial fever has been found to be infested with Protozoan parasites. These microscopic beings are developed from spindle-shaped germs which enter the human body when the mosquito stabs the skin, and drops into the wound a tiny spot of saliva in which may be immense numbers of disease germs. The blood parasites undergo marvellous transformations, resulting in shapes which call to mind the tadpole, and even the octopus, but still almost incalculably minute. The Sleeping Sickness that is a deadly scourge to mankind in Africa, and the Tsetse disease which afflicts domestic animals, are both due to Protozoan parasites which are inoculated into human beings and cattle when bitten by tsetse flies of different species. These tiny organisms were unsuspected until about the year 1882, but the study of germs, or bacteria, which conduce to diseases of many kinds, is now one of the most important branches of medical science; and constantly fresh discoveries lead to the alleviation of human suffering.

We have now turned over the pages of the book of Nature, albeit sometimes hastily ; we have surveyed the wonderful pageant of animal life, from the highly organised Mammals to the tiniest of Animalcules which scarcely can be distinguished from vegetable germs—a wondrous whole that, while gratifying our curiosity and increasing our knowledge, must of necessity fill us with admiration for the wise economy and the Supreme intelligence displayed in all the species of living creatures that have been “ put under our feet.”

INDEX

- Aard-Vark, 228
 Aard Wolf, 75
Acanthopterygii, 466
Acari (Mites and Ticks), 532
Accipitres (Diurnal Birds of Prey), 322-336
 Acorn Barnacle, 527
Acromyodi, 253
Aculeata, 507
 Adder, British, 422
 Death, 421
 Puff, 423
 Adjutant, 344
Ægeriidae, 502
Agamidae, 410
 Agamoid Lizards, 410
Agelenidae, 529
 Agile Gibbon, 13
 Agouti, 136
 Ai, 224
Alaudidae, 278
 Albatross, 379
Alcidae, 382
Alectorides (Bustards and Cranes), 367-369
 Alligator, 398
 Alpaca, 207
 Alpine Marmot, 122
 Amherst's Pheasant, 359
Ampelidae, 296
Amphibia (Amphibians), 431-438
Amphisbæna, 413
Anabantidae, 463
Anacanthini, 465
 Anaconda, 427
Anatidae, 346
 Anchovy, 454
Andrenidae, 507
 Anemone, Sea, 542
 Angler-fish, 477
 Angora Goat, 168
Anguidae, 413
Anguillidae, 458
 Animalcules, 547
Annelida, 536
Anomura, 522
Anseres (Duck Tribe), 346-352
 Ant, 508
 Ant Bear, 225
 Ant-Eater, 225
 Ant-Eater, Porcupine, 243
 Antelope :
 Chamois, 173
 Eland, 174
 Gemsbok, 175
 Beatrice, 175
 Beisa, 176
 Nilgai, 176
 Sable, 177
 Gazelle, 178
 Springbok, 179
 Waterbuck, 180
 Hartebeest, 180
 Blesbok, 181
 Gnu, 181
 Klipspringer, 183
 Duiker, 183
 Four-horned, 183
 Dik-dik, 183
 Royal, 184
Anthozoa, 540
Anthropoidea, 7
Antilocapridae, 184
Antilopidae, 173-185
 Ant-Lion, 498
 Ant, White, 499
Anura (Frogs and Toads), 431-436
 Ape, Barbary, 24
 Apes, Man-like, 7-13
Aphidae, 521
 Aphis, Rose, 521
Apidae, 507
Apoda, 438
Apodes, 450
 Apple-blight Insect, 521
 Arabian Baboon, 27
 Arabian Camel, 203
Arachnida (Spiders and Scorpions), 528-532
Araneæ (Web-Spiders), 528-531
 Arapaima, 454
 Archer Fish, 469
 Arctic Fox, 88
 Arctic Tern, 378
Arctiidae, 503
Ardeidae, 341
 Argali, 167
Argiopidae, 529
 Argonaut, 485
Argonautidae, 485
 Argus Pheasant, 359
 Armadillo, 226
 Arnee, 162
Arthropoda, 492
Artiodactyla, 157
 Arui, 167
 Ass, 154
 Assapan, 121
Astacidea, 526
Asteroidea, 538
Astylopterygii (Ganoid Fishes) 449-450
 Atlas Moth, 505
 Audad, 167
 Auk, 383
 Aurochs, 159
 Australian Bear, 236
 Australian Fruit Bat, 46
Aves (Birds), 247-390
 Avocet, 375
 Axis Deer, 193
 Aye-Aye, 38
 Babirusa, 210
 Baboon :
 Chacma, 26
 Yellow, 27
 Sacred, 27
 Mandrill, 28

- Bactrian Camel, 205
 Badger :
 Common, 96
 American, 97
 Indian Sand, 97
 Malayan, 97
 Baikal Seal, 111
Balæntidæ, 218
 Bandicoot, 237
 Bantam Fowl, 361
 Banting, 159
 Barbary Ape, 24
 Barbel, 456
 Barking Deer, 196
 Barnacle, 527
 Barn-door Fowl, 361
 Barn Owl, 319
 Basilisk, 411
 Basking Shark, 445
 Bass, 467
 Bat :
 Pipistrelle, 42
 Long-eared, 42
 Greater Horseshoe, 42
 Vampire, 44
 Indian Fox, 45
 Kalong, 45
 Australian Fruit, 46
 Bats (*Chiroptera*), 40-46
Batrachia, 2, 431
 Batrachians, 431
 Beadlet Anemone, 543
 Beaked Lizard, 428
 Bean Goose, 347
 Bear :
 Brown, 102
 Black, 104
 Spectacled, 104
 Syrian, 104
 Grizzly, 104
 Malayan, 105
 Sloth, 106
 Polar, 107
 Bear, Ant, 225
 Bear, Australian, 236
 Bear, Sea, 115
 Beatrix Antelope, 175
 Beaver, 123
 Bêche-de-Mer, 539
 Bee-eater, 309
 Bee, 510
 Beetle :
 Tiger, 516
 Bombardier, 517
 Water, 517
 Whirligig, 517
 Rove, 517
 Burying, 517
 Stag, 518
 Beetle :
 Cockchafer, 518
 Hercules, 518
 Goliath, 519
 Glow-worm, 519
 Fire-fly, 519
 Death-Watch, 520
 Oil, 520
 Weevil, 520
 Colorado, 520
 Lady-bird, 520
 Beisa Antelope, 176
 Bell Bird, 302
 Beluga, 222
 Bewick's Swan, 349
 Bighorn, 167
 Bird-eating Spider, 530
 Bird of Paradise, 299
 Birds (*Aves*), 247-390
 Bison, 161
 Bittern, 342
 Bivalves, 490
 Black-backed Gull, 376
 Black Bear, 104
 Blackbird, 255
 Blackcap, 262
 Black-faced Lemur, 36
 Black Fox, 88
 Black Grouse, 356
 Black Ibis, 345
 Black Monkey, 23
 Black Ouzel, 256
 Black Rat, 128
 Black Redstart, 258
 Black Saki, 32
 Black Scoter, 351
 Black Spanish Fowl, 361
 Black Swan, 349
 Black Turkey-Vulture, 335
 Bladder-nosed Seal, 112
 Blandford's Sheep, 167
Blattidæ, 493
 Blenny, 477
 Blesbok, 181
 Blind-Worm, 413
 Bluebottle-fly, 513
 Blue Bull, 176
 Blue Fox, 88
 Blue Rock Dove, 353
 Blue Shark, 445
 Blue Tit, 275
 Boa, 426
Boinæ, 426
 Bombardier Beetle, 517
Bombycidæ, 506
 Bonito, 470
 Bot-fly, Horse, 515
 Bottle-nose Whale, 221
 Bottle Tit, 275
Bovidæ, 157
 Bower Bird, 300
 Bow-fin, 450
Brachyura, 522
Bradypodidæ, 224
 Brahmin Bull, 158
 Bream, 456
 Breeze-fly, 515
 Brent Goose, 347
 Broad-banded Armadillo, 227
 Broad-fronted Crocodile, 398
 Brook Trout, 452
 Brown Ant, 509
 Brown Bear, 102
 Brown Rat, 128
 Brush-Turkey, 363
Bucerotidæ, 303
 Buffalo :
 European, 162
 Indian, 162
 Cape, 163
 Dwarf, 163
*Bufo**nidæ*, 434
 Bugs, 522
 Bullfinch, 271
 Bull Frog, 433
 Bull-head, 475
 Bunting :
 Common, 273
 Corn, 273
 Cirl, 273
 Yellow, 273
 Ortolan, 274
 Snow, 274
 Burbot, 466
 Burrowing Flea, 516
 Burying Beetle, 517
 Bushmaster, 424
 Bustard, 367
 Butcher Bird, 295
 Butterfly :
 Cabbage White, 501
 Orange Tip, 501
 Swallow-tailed, 501
 Peacock, 501
 Red Admiral, 501
 Painted Lady, 501
 Camberwell Beauty, 501
 Tortoise-shell, 501
 Fritillary, Queen of Spain, 502
 Cabbage White Butter-fly, 501
 Cachalot, 220

Caiman, 399
 Californian Vulture, 335
 Calling-Crab, 524
 Camberwell Beauty, 501
 Camel, Arabian, 203
 Camel, Bactrian, 205
Camelidæ, 203
 Camelopard, 185
Camelopardalidæ, 185
 Campanero, 302
 Canary, 271
Cancridæ, 522
 Candle Fish, 452
Canidæ (Dogs), 78
 Canvas-backed Duck, 350
 Cape Buffalo, 163
 Cape Hunting Dog, 84
 Cape Hyrax, 144
 Cape Jumping Hare, 126
 Cape Penguin, 386
 Cape Polecat, 96
 Capercaillie, 355
Capra (goats), 168-173
Caprimulgidæ, 303
 Capuchin Monkey, 31
 Capybara, 137
Carabidæ, 517
 Caracal, 70
Carchariidæ, 444
 Cardinal, Red, 267
 Carey's Chicken, Mother, 380
 Cariama, 368
 Caribou, 198
Carnivora (Flesh-eating Mammals):
 Cats, 55
 Civets, 72
 Mongoose, 74
 Aard Wolf, 75
 Hyænas, 76
 Dogs, 78
 Weasels, 89
 Raccoons, 100
 Bears, 102
 Seals, 108
 Walrus, 116
 Carp, 456
 Carpenter Bee, 512
 Carpincho, 138
 Carrier Pigeon, 353
 Carrion Crow, 287
 Cashmere Goat, 168
 Cashmere Stag, 190
 Caspian Seal, 111
 Cassowary, 389
Castoridæ, 123
Catadontidæ, 220

Cat-fish, 455
Cathartidæ, 335
Catosteomi, 461
 Cat :
 Bush, 67
 Fishing, 68
 Wild, 68
 Domestic, 69
 Native, 238
 Cattle-Tick, 533
 Cave Fish, 461
Caviidæ, 137
 Cawquaw, 135
Cebidæ, 29
 Cecropian Silk-Moth, 506
Centetidæ, 53
 Centipede, 534
Cephalopoda (Head-footed Molluscs), 484
Cercopithecinae, 17
Certhiidæ, 293
Cervidæ (Deer), 190-202
Cetacea (Whales and Dolphins), 217-224
 Chacma, 26
 Chætodont, 469
 Chaffinch, 268
 Chamæleon, 414
Chamæleontidæ, 414
 Chamois, 173
Charadriidæ, 370
 Chats, 261
 Chatterer, 296
 Cheese-Mite, 533
 Cheetah, 71
Chelonia (Tortoises and Turtles), 401-407
Chelonidæ, 405
Chelydridæ, 404
 Chevrotain, 203
 Chiff-chaff, 264
Chilopoda (Centipedes), 534
 Chimpanzee, 10
 Chinchilla, 138
Chinchillidæ, 138
 Chipmunk, 121
 Chipping Squirrel, 121
Chiromyidæ, 38
Chiroptera (Bats), 40-46
 Chital, 193
Chordata, 483
 Chough, 292
Chrysopidæ, 497
 Chub, 458
 Church Owl, 320
 Cicada, 521
Cicindelidæ, 516
Ciconiidæ, 343

Cinclidæ, 294
 Cirl Bunting, 273
Cirripedia, 527
 Civet, 72
 Clam, 490
 Cleg, 515
 Climbing Perch, 463
Clupeidæ, 453
 Coaita, 29
 Coaiti, Red, 100
 Coaiti, White-nosed, 101
 Coal Tit, 275
 Cob, 377
 Cobego, 54
 Cobra, 420
Coccidæ, 521
Coccinellidæ, 520
Coccothraustinae, 266
 Cochinchina Fowl, 361
 Cochineal Insect, 521
 Cockatoo, 316
 Cockchafer, 518
 Cockle, 490
 Cock of the Rock, 302
 Cock of the Woods, 356
 Cockroach, 493
 Cocoa-nut Crab, 525
 Cod, 465
 Cæcilia, 438
Cæciliidæ, 438
Cæloenterata, 540-544
 Colorado Beetle, 520
Coleoptera (Beetles) 516-521
 Collared Lemur, 36
 Collared Peccary, 212
Colubridæ, 418
 Colugo, 54
Columbæ (Pigeons), 352
Columbidæ, 353
Colymbidæ, 385
 Condor, 335
 Coney, 144
 Coot, 366
 Coral, 543
 Cormorant, 337
 Corn Bunting, 273
 Corncrake, 365
Corvidæ, 285
Corvinæ, 285
Cossidæ, 502
Cotingidæ, 302
Cottidæ, 475
 Cougar, 65
 Courser, 376
 Cowry, 487
 Coyote, 80
 Crab :
 Edible, 522

- Crab :
 Swimming, 523
 Green, 523
 River, 523
 Land, 524
 Spider, 524
 Giant, 524
 Swift-footed, 524
 Calling-, 524
 Hermit-, 524
 Stone-, 525
 Cocoa-nut, 525
Crabronidæ, 507
Cracidæ, 363
 Crane, 369
 Crane-fly, 513
Crangonidæ, 526
 Cray-fish, 526
 Cream-coloured Courser, 376
 Cream-spot Tiger-Moth, 503
 Creeper, Tree, 293
 Crested Newt, 437
 Crested Seal, 112
 Crocodile :
 Indian, 396
 Estuarine, 398
 Nile, 398
 Broad-fronted, 398
 Gangetic Garial, 398
Crocodylia, 395-401
 Crossbill, 272
 Cross-fish, 539
 Cross Spider, 529
 Crow, Carrion, 287
 Crow, Hooded, 287
Crustacea (Crabs, Lobsters, etc.), 522-528
Ctenizidæ, 531
 Cuckoo, 305
 Cuckoo's Mate, 307
Cuculidæ, 303
Culicidæ, 513
 Currasow, 363
 Curlew, 374
Cursores, 387
Cursoriidæ, 375
 Currant Clearwing, 502
 Cuscus, 233
 Cuttle-fish, 486
Cyclostomi, 480
Cynipidæ, 507
 Cynogale, 73
Cyprinidæ, 456
Cypselidæ, 303
 Dabchick, 384
 Dace, 458
 Daddy-Long-legs, 513
 ' Dansador,' 303
 Dartford Warbler, 264
 Darter, 337
 Darwin's Frog, 433
Dasypodidæ, 226
Dasyproctidæ, 136
 Dasyure, Spotted, 238
 Dasyure, Ursine, 238
Dasyuridæ, 238
 Death Adder, 421
 Death's-head Hawk-Moth, 502
 Death-Watch, 520
Decapoda (Ten-footed Molluscs), 485
Decapoda (Ten-legged Crustaceans), 522-527
 Deer :
 Red, 190
 Wapiti, 192
 Axis, 193
 Sambar, 194
 Fallow, 195
 Muntjac, 196
 Roe, 197
 Reindeer, 198
 Elk, 200
 Musk, 201
 Deerlet, 202
Delphinidæ, 221
Dermoptera, 54
 Devil-fish, 447
 Devil-fish, 485
 Devil's Coach-horse, 517
 Diamond Rattle-Snake, 424
 Diana Monkey, 20
Dicotylidæ, 211
Didelphidæ, 240
 Dik-dik, 183
 Dingo, 84
Diomedeidæ, 380
Diplopoda (Millipedes), 535
Dipnoi (Lung-fishes), 448
Dipodidæ, 125
 Dipper, 294
Diptera (Two-winged Flies), 512-516
 Diver, Great Northern, 385
 Diving Birds (*Pygopodes*), 381-385
 Dog :
 Indian, Wild, 83
 Dingo, 84
 Cape Hunting, 84
 Dog :
 Domestic, 85
 Pariah, 86
 Dog-fish, 444
 Dog-headed Baboon, 26
 Dog, Prairie, 122
 Dolphin, 222
 Dormouse, 133
 Dorking Fowl, 361
 Dotterel, Ringed, 371
 Dourocouli, 33
 Dove, 353
 Dragon-fly, 497
 Dragon, Flying, 410
 Driver Ant, 509
 Dromedary, 205
 Drone-fly, 514
 Duck :
 Mallard, 349
 Sheld-, 350
 Shoveler, 350
 Teal, 350
 Wigeon, 351
 Pochard, 351
 Eider, 351
 Scoter, 351
 Goosander, 352
 Merganser, 352
 Duckbill, 242
 Duck Tribe (*Anseres*), 346-352
 Dugong, 216
 Duiker, 183
Duplicidentata, 140
 Dwarf Buffalo, 163
Dytiscidæ, 517
 Dziggetai, 154
 Eagle :
 Harpy, 328
 Imperial, 328
 Bald, 328
 White-tailed Sea, 329
 Golden, 329
 Monkey-eating, 331
 Eagle Owl, 321
 Eared Seals, 108
 Earless Seals, 108
 Earth-Pig, 228
 Earwig, 493
Echeneidæ, 476
 Echidna, 243
Echinodermata, 538-540
Echinoidea, 538
Edentata (Toothless Animals), 224-229
 Edible Crab, 522
 Edible Frog, 432

- Eel, 458
 Conger, 459
 Electric, 455
 Eel, Mud-, 438
 Eel-Pout, 466
 Eft, 437
 Egg-eating Snake, 419
 Egg-laying Mammals, 242-243
 Egret, 341
 Egyptian Goose, 348
 Egyptian Vulture, 332
 Eider Duck, 351
 Eland, 174
Elasmobranchii (Sharks and Rays), 444-448
 Electric Eel, 455
 Electric Ray, 447
 Elephant, African, 147
 Elephant, Indian, 145
Elephantidæ, 144
 Elephant, Sea, 112
 Elephant Seal, 112
 Elephant Shrew, 53
 Elk, 200
 Elk, Irish, 196
 Ember Goose, 385
Emberizinae, 266
 Emperor Moth, 505
 Emperor Penguin, 386
 Emu, 389
 Entellus, 15
Epeiridæ, 529
Ephemeridæ, 497
Equidæ, 152-157
 Erd Shrew, 51
Erinaceidæ, 47
 Esculent Swift, 312
Esocidæ, 460
 Estuarine Crocodile, 398
 Euplectellid Sponge, 547
 Evat, 437
 Eyed Hawk-moth, 502

Falconidæ, 323
 Falcon, Peregrine, 323
 Falcon, Jer-, 324
 Falcon, Iceland, 324
 Fallow Deer, 195
 'Fandango' Bird, 303
 Fantail Pigeon, 353
 Fat Dormouse, 134
Felidæ (Cats), 55-71
 Fennec, 89
 Fer-de-lance, 425
 Ferret, 93
 Fieldfare, 256
 Field Vole, 129
 Fighting-fish, 469

 Finch :
 Chaf-, 268
 Gold-, 269
 Linnet, 269
 Sparrow, House, 270
 Sparrow, Tree, 270
 Serin, 271
 Canary, 271
 Bull-, 271
 Crossbill, 272
 Fire-fish, Red, 475
 Fire-fly, 519
 Firetail, 257
 Fishes (*Pisces*), 441-480
 Fishing-Frog, 477
 Fishing Hawk, 322
Fissipedia, 108
 Flamingo, 340
 Flat-fish, 472
 Flea, 515
 Flesh-eating Mammals (*Carnivora*), 55-118
 Flounder, 473
 Fly :
 House-, 513
 Bluebottle-, 513
 Crane-, 513
 Gnat, 513
 Drone-, 514
 Horse-, 515
 Gad-, 515
 Tsetse-, 515
 Flycatcher, 294
 Flying Dragon, 410
 Flying Fish, 464
 Flying Fox, 45
 Flying Frog, 433
 Flying Lemur, 54
 Flying Phalanger, 235
 Flying Squirrel, 121
 Footless Amphibians, 438
 Foraging Ant, 509
Foraminifera, 547
Formicidæ, 507
 Four-eyed Fish, 461
 Four-horned Antelope, 183
 Fowls and game-birds (*Gallinæ*), 355-364
 Fox :
 Common, 86
 Arctic, 88
 Black, 88
 Silver, 88
 Fox-tailed Monkey, 32
 Fox Shark, 446
Fregilinæ, 285
Fregatidæ, 339

 Frigate Bird, 339
Fringillidæ, 266
Fringillinæ, 266
 Fritillary, 502
 Frog' :
 Common, 432
 Edible, 432
 Bull, 433
 Green Tree-, 433
 Flying-, 433
 Pouched Tree-, 433
 Darwin's, 433
 Fruit Bat, 45
 Fruit Pigeon, 353
Fulicariæ (Rails and Coots), 365-367
 Fur Seals, 109
 Furze-pig, 47

 Gad-fly, 515
Gadidæ, 465
 Galago, 37
Gallinæ (Fowls and Game-birds), 355-364
Galeopithecidæ, 54
 Gall-fly, 508
 Gall-Wasp, 508
 Game-birds, 355
 Game-fowl, 361
Gammaridea, 526
 Gannet, 337
 Ganoid Fishes, 449-450
 Garden Spider, 529
 Gar-fish, 464
 Garial, 398
 Gar-Pike, 450
Garrulinæ, 285
Gastropoda (Univalves), 484
 Gastropods, 487
 Gaur, 159
Gaviæ (Gulls, etc.), 376-379
 Gayal, 159
 Gazelle, Dorcas, 178
 Gecko, 408
Geckonidæ, 408
 Gemsbok, 175
 Genet, 73
Geocarcinidæ, 524
Geometridæ, 503
Geophilomorpha, 534
 Giant Crab, 524
 Giant Humming-Bird, 313
 Giant Toad, 435
 Gibbon, 13
 Gila Monster, 413
 Giraffe, 185

- Glareolidæ*, 375
 Globe-fish, 478
Glomeridæ, 535
 Glossy Ibis, 345
 Glow-worm, 519
 Glutton, 94
 Gnawing Animals (*Rodentia*), 118-143
 Goat :
 Common, 168
 Angora, 168
 Cashmere, 168
 Ibex, 169
 Markhor, 170
 Pasang, 171
 Tahr, 171
 Nilgiri, 171
 Goral, 171
 Serow, 171
 Takin, 171
 Rocky Mountain, 172
 Goat Moth, 502
 Goatsucker, 311
 Goby, 474
 Goldcrest, 277
 Golden Eagle, 329
 Golden-eyed Fly, 498
 Golden Pheasant, 359
 Golden Plover, 370
 Goldfinch, 269
 Gold-fish, 456
 Goliath Beetle, 519
 Gooch, 167
 Goosander, 352
 Goose :
 Grey Lag, 347
 Bean, 347
 Brent, 347
 Pink-footed, 348
 White-fronted, 348
 Bernicle, 348
 Egyptian, 348
 Goose Barnacle, 528
 Goose, Solan, 337
 Gooseberry Saw-fly, 507
 Goral, 171
 Gorilla, 7
 Goshawk, 327
 Grampus, 223
 Grasshopper, 496
 Grayling, 452
 Great Atlas Moth, 505
 Great Caiman, 399
 Greater Bird of Paradise
 299 [42
 Greater Horseshoe Bat,
 Greater Pettichaps, 264
 Great Flying Phalanger,
 235
 Great Grey Shrike, 295
 Great Skua, 379
 Great Spotted Wood-
 pecker, 304
 Great Titmouse, 274
 Grebe, 384
 Green Crab, 523
 Greenfinch, 267
 Green-fly, 521
 Greenland Seal, 111
 Greenland Whale, 218
 Green Monkey, 19
 Green Plover, 371
 Greenshank, 375
 Green Snake, 419
 Green Tree-frog, 433
 Green Woodpecker, 304
 Grey Lag Goose, 347
 Grey Parrot, 314
 Grey Plover, 371
 Grey Seal, 112
 Grey Wagtail, 280
 Griffon Vulture, 332
 Grivet Monkey, 19
 Grizzly Bear, 104
 Grouse, 355
 Grosbeaks, 267
Gruidæ, 368
 Grunting Ox, 160
Gryllidæ, 493
 Guan, 364
 Guanaco, 207
 Gudgeon, 456
 Guenons, 18
 Guerezas, 16
 Guillemot, 383
 Guinea Fowl, 362
 Guinea Pig, 137
 Gull :
 Common, 376
 Black-backed, 376
 Herring, 377
 Kittiwake, 377
 Gurnards, 475
Gymnotidæ, 455
 Hackee, 121
 Haddock, 466
 Hag-fish, 480
 Hair Seals, 109
 Hake, 466
 Halibut, 474
Halcyonidæ, 303
 Hammer-head Shark,
 446
 Hamster, 131
 Hang-nest, 296
 Hangul, 190
 Hanuman Monkey, 15
Hapalidæ, 33
Haplomi, 460
 Hare, Arctic, 141
 Hare, Common, 140
 Hare, Jumping, 126
 Hare, Mountain, 141
 Harp Seal, 111
 Harpy Eagle, 328
 Harriers, 327
 Hartebeest, 180
 Harvest-bug, 533
 Harvest Mouse, 127
 Hausa Sheep, 165
 Hawfinch, 268
 Hawk, Fishing, 322
 Hawk, Sparrow, 326
 Hawk, Stone, 324
 Hawk-Moths, 502
 Hay-Bird, 265
 Hedge Accentor, 263
 Hedgehog, 47
 Hedge-pig, 47
 Hedge Snake, 419
 Hedge Sparrow, 263
 Heirie, 205
Helodermatidæ, 413
 Heloderm, Mexican, 413
 Heloderm, Arizona, 414
 Hercules Beetle, 518
 Hermit-Crab, 524
Herodiones (Herons and
 Storks), 341-346
 Heron, 341
 Herring Gull, 377
Heterocera, 500
Heteromera, 516
Hippopotamidæ, 213
 Hippotamus, 213
Hirudinea, 536
Hirundinidæ, 282
 Hive-Bee, 510
 Hoatzin, 364
 Hog, 207
 Black, 210
 Pigmy, 209
 Wart, 209
 Water, 137
 Hollow-horned Rumin-
 ants, 157
Holothuroidea, 538
Holocephali (Chimæ-
 roids), 444
Homaridæ, 526
 Homing Pigeon, 353
 Honey-Bee, 510
 Hooded Crow, 287
 Hooded Seal, 112
 Hoofed Animals (*Ungu-
 lata*), 143-215

Hoopoe, 308
 Hornbill, 309
 Hornet, 510
 Horse, Domestic, 152
 River, 213
 Sea, 116
 Horse Sponge, 546
 Horse-stinger, 497
 Horse, Wild, 153
 House-fly, 513
 House Martin, 283
 House Mouse, 126
 House Sparrow, 270
 House-Spider, 529
 Howling Monkey, 31
 Humble-Bee, 511
 Humming-Birds, 313
 Hunting Leopard, 71
 Hump-backed Whale, 220
 Hyæna :
 Striped, 76
 Spotted, 77
 Brown, 78
Hyænidæ, 76
 Hydra, 542
Hydromedusæ, 542
Hymenoptera (Membrane-winged Insects), 507-512
Hyracidæ, 143
Hyracoidea, 143
 Hyrax, 143
Hystrioidæ, 134

 Ibex, Caucasian, 170
 Ibex, European, 169
 Ibis, 345
 Ice Bear, 107
 Ichneumon-fly, 508
Ichneumonidæ, 507
Icteridæ, 296
 Iguana, 412
Iguanidæ, 411
Impennes (Penguins), 385-386
 Imperial Eagle, 328
 Impoofo, 174
 Indian Buffalo, 162
 Indian Cobra, 420
 Indian Crocodile, 396
 Indian Jackal, 81
 Indian Python, 426
 Indian Rhinoceros, 150
 Indri Lemur, 36
Infusoria, 548
Insecta (Insects), 492-522

Insectivora (Insect Eating Mammals), 46-55
Invertebrata (Invertebrates), 483-549
Isospondyli, 450
 Irish Elk, 196
 Itch Mite, 533
Ixodidæ, 533

 Jackal :
 Black-backed, 82
 European, 83
 Indian, 81
 Jackdaw, 288
 Jaguar, 64
 Jay, 291
 Jelly-fish, 541
 Jerboa, 125
 Jerfalcon, 324
 Jigger, 516
 John Dory, 472
 Jumping-fish, 475
 Jumping Hare, 126
 Jumping Shrew, 53
 Jungle Fowl, 361
 Jungle Sheep, 197

 Kakar, 196,
 Kalong, 45
 Kanchil, 203
 Kangaroo :
 Great Grey, 229
 Red, 231
 Tree, 231
 Brush, 232
 Rat, 232
 Kea, 315
 Keitloa, 151
 Kentish Plover, 371
 Kestrel, 325
 Kiang, 154
 Killer Whale, 223
 Kingfisher, 307
 King Vulture, 335
 Kinkajou, 101
 Kite, 325
 Kittiwake, 377
 Kiwi, 389
 Klipspringer, 183
 Koala, 236
 Koulan, 154

Lacertidæ, 409
Lacertilia (Lizards), 407-414
 Lace-Wing Fly, 498
 Lac Insect, 521
 Lady-bird, 520
 Lamellicorn Beetles, 518

Lammergeier, 333
Lamnidæ, 446
 Lamprey, 480
Lampyridæ, 519
 Land Crab, 524
Laniidæ, 295
 Lapwing, 371
 Large Garden Butterfly, 501
Larinæ, 376
 Laughing Hyæna, 77
 Leaf Insect, 495
 Leaf-cutting Bee, 512
 Leech, 537
 Lemming, 132
 Lemon Sole, 474
Lemuridæ, 35
Lemuroidea, 35
 Lemur :
 Ruffed, 35
 Ring-tailed, 36
 Red, 36
 Collared, 36
 Black-faced, 36
 White-fronted, 36
 Indri, 36
 Mouse, 36
 Flying, 54
 Leopard, 62
 Leopard Cat, 66
 Leopard Seal, 112
Lepidoptera (Butterflies and Moths), 500-507
Leporidæ, 140
 Lesser Bird of Paradise, 300
 Lesser Pettichaps, 264
 Lesser Spotted Woodpecker, 304
Libellulidæ, 497
Limicolæ (Plovers), 370-376
 Limpet, 488
 Ling, 466
 Linnet, 269
 Lion, 56
 Lion Marmoset, 34
Lithobiomorpha, 535
 Lizard :
 Common, 409
 Sand, 409
 Green, 409
 Flying Dragon, 410
 Tree, 410
 Variable, 410
 Moloch, 411
 Frilled, 411
 Basilisk, 411
 Iguana, 412

- Lizard :
 Blind-worm, 413
 Amphisbæna, 413
 Heloderm, 413
 Llama :
 Common, 206
 Alpaca, 207
 Guanaco, 207
 Vicuna, 207
 Lobster, 526
 Locust, 496
Locustidæ, 493
 Loir, 134
Loliginidæ, 485
 Long-eared Bat, 42
 Long-eared Owl, 320
 Long-tailed Tit, 276
Loriidæ, 314
 Loriquet, 318
 Loris, Slender, 37
 Lory, 318
 Louse, Wood-, 528
 Love-Bird, 317
 Lunar Hornet Clear-wing, 502
Lycosidæ, 530
 Lynx, 69
 Lyre Bird, 300
 Lyssacine Sponge, 547

 Macaque, 22
 Macaw, 316
 Mackerel, 469
Macroscelididæ, 53
Macropodidæ, 229
Macrura, 526
 Madagascar Hedgehog, 53
 Madge Owl, 320
 Magot, 24
 Magpie, 290
Maidæ, 524
 Malayan Bear, 105
 Malay Fox Bat, 45
 Mallard, 349
Mammalia (Mammals), 3-241
 Manakin, 303
 Manatee, 215
 Mandrill, 28
 Mangabey, 22
Manidæ, 227
 Man-of-War Bird, 339
 Mantidæ, 493
 Mantis, Praying, 494
 Marabou Stork, 344
 Marakina, 34
 Maral, 190
 Marmoset, 33

 Marsh Tit, 275
 Marten, Beech, 91
 Marten, Pine, 90
 Martin, House, 283
 Martin, Sand, 283
 Markhor, 170
 Marmot, 122
 Marsh Crocodile, 398
Marsupialia (Pouched Animals) : 229-241
 Mavis, 254
 May-fly, 498
 Meadow Pipit, 281
 Medusæ, 541
Megachiroptera, 45
Megapodes, 363
Megapodiidæ, 363
Meloidæ, 520
Menuridæ, 300
 Merganser, 352
 Merino Sheep, 165
 Merle, 256
 Merlin, 324
Meropidæ, 303
Mesomyodi, 253
Microchiroptera, 41
 Midwife Toad, 435
 Miller's Thumb, 475
 Millipede, 535
Mimidæ, 297
 Mink, 94
 Missel Thrush, 254
 Mite, 532
 Mochucho, 152
 Mocking Bird, 297
 Mole, 49
 Mole Cricket, 496
 Mole, Water, 242
Mollusca, 484-491
 Mona Monkey, 18
 Monitor, 414
 Monkey :
 Hanuman, 15
 Guereza, 16
 Proboscis, 17
 Green, 19
 Vervet, 19
 Grivet, 19
 Diana, 20
 Rolloway, 21
 Patas, 21
 White-nosed, 21
 Mangabey, 22
 Macaque, 22
 Wanderoo, 23
 Barbary Ape, 24
 Spider, 29
 Saki, 32
 Douricouli, 33

 Monk Seal, 112
Monotremata, 242-243
 Moorhen, 366
 Moose, 200
 Morse, 116
 Mosquito, 514
Motacillidæ, 279
 Moth :
 Death's-head Hawk, 502
 Eyed Hawk-, 502
 Currant Clearwing, 502
 Lunar Hornet Clear-wing, 502
 Goat, 502
 Tiger-, 503
 Cream-spot Tiger-, 503
 Puss, 503
 Swallow-tailed, 504
 Emperor, 505
 Great Atlas, 505
 Oak Silk-, 506
 Cecropian Silk-, 506
 Common Silk-, 506
 Mouflon, 166
 Mound-builder, 363
 Mouse :
 House, 126
 Harvest, 127
 Short-tailed Field, 129
 Mouse Deer, 202
 Mouse Lemur, 36
 Mud-Eel, 438
 Mud-skipper, 475
 Mugger, 396
Mugilidæ, 463
 Mule, 155
 Mullet :
 Grey, 463
 Red, 468
 Striped, 468
 Mongoose, Egyptian, 74
 Mongoose, Indian, 75
 Muntjac, 196
Muridæ, 126
Muscidæ, 513
Muscapidæ, 294
 Musk Deer, 201
 Musk Ox, 163
 Musk Rat, 130
 Musquash, 130
 Mussel, 490
 Mustang, 153
Mustelidæ, 89
 Mute Swan, 348
Mygale, 530
Myoxidæ, 133

- Myriopoda*, 534
Myrmecophagidæ, 225
Myrmeleontidæ, 497
Mystacoceti, 217

Narwhal, 221
Native Cat, 238
Natterjack Toad, 434
Nautilus, Paper, 485
Nemathelminthes, 537
Neuroptera (Nerve-winged Insects), 497-500
Newt, 437
Nightingale, 259
Nightjar, 311
'Nil Bhunder,' 23
Nile Crocodile, 398
Nilgai Antelope, 176
Nilgiri Goat, 171
Noctiluca, 548
Northern Whale, 218
Norwegian Rat, 128
Notodontidæ, 503
Nutteracker, 292
Nuthatch, 293
Nutmeg Pigeon, 353
Nut Weevil, 520
Nymphalidæ, 501

Oak-gall Wasp, 508
Oak Silk-Moth, 506
Octopoda, 485
Octopodidæ, 485
Octopus, 485
Ocyrodidæ, 524
Oniscoidæ, 528
Orang-Utan, 11
Ocelot, 66
Odontoceti, 217
Odontoglossi (Flamingoes), 340-341
Æstridæ, 513
Oil Beetle, 520
Okapi, 188
Olm, 438
Onager, 154
Ondatra, 130
Oolachan, 452
Ophidia (Snakes), 416-428
Opossum, 240
Orange Tip Butterfly, 501
Oriole, Golden, 296
Oriole, American, 296
Oriolidæ, 295

Orthoptera (Straight-winged Insects), 493-497
Ortolan Bunting, 274
Orycteropidæ, 228
Oryx, 175
Osprey, 322
Ostariophysi, 450
Ostreidæ, 490
Ostrich, 387
Otariidæ, 113
Otididæ, 367
Otter, Common, 98
Otter, Sea, 99
Ouititi, 34
Ounce, 63
Ouzel :
 Black, 256
 Ring, 256
 Water, 294
Ovidæ (Sheep), 164
Owl :
 Barn, 319
 Tawny, 320
 Long-eared, 320
 Short-eared, 320
 Snowy, 321
Owl Parrot, 315
Owls (*Striges*), 318-321
Ox-eye, 274
Ox :
 Common, 157
 Indian, 158
 Javan, 159
 Grunting, 160
 Musk, 163
Ox-Pecker, 285
Ox Warble-fly, 515
Oyster, 490
Oyster-Catcher, 372

Painted Lady Butterfly, 501
Painted Pigeon, 353
Palamedæ (Screamers), 352
Palæmonidæ, 526
Palm Weevil, 520
Pandiones, 322
Pangolin, 227
Pandionidæ, 322
Panther, 62, 65
Paper-Wasp, 510
Papilionidæ, 501
Paradise, Bird of, 299
Paradiseidæ, 299
Pariah Dog, 86
Paridæ, 274
Parroquet, 317

Parrots (*Psittaci*), 313-318
Partridge, 357
Pasang, 171
Passenger Pigeon, 354
Passeres (Perching Birds), 253-303
Pastor, Rose-coloured, 285
Patas Monkey, 21
Peacock Butterfly, 501
Peafowl, 360
Pearl Oyster, 490
Peccary, 211
Pecora, 157
Peewit, 371
Pelecypoda (Bivalves), 484
Pelican, 338
Penguin, 385
Pentail, 54
Pentamera, 516
Peramelidæ, 237
Perching Birds (*Passeres*), 253-303
Perciformes, 466
Percosoces, 463
Perch, 466
Peregrine Falcon, 323
Perissodactyla, 149
Peristeridæ, 354
Periwinkle, 487
Petrel, 380
Phaëthontidæ, 339
Phalanger :
 Common, 234
 Ring-tailed, 234
 Flying, 235
 Squirrel-like, 235
 Pigmy Flying, 236
Phalangitidæ, 233
Phascolomyidæ, 236
Phasianidæ, 357
Phasmidæ, 493
Phatagin, 228
Pheasant :
 Common, 358
 Silver, 359
 Golden, 359
 Amherst's, 359
 Argus, 359
Philanthidæ, 507
Phænicopteridæ, 340
Phyllostomatidæ, 44
Phylloxera, 521
Physalia, 541
Physoclisti, 450, 461
Physostomi, 450
Picariæ (Woodpeckers, etc.), 303-313

- Picidæ*, 303
 Pichiago, 227
 Pied Fox, 88
 Pied Wagtail, 279
 Pie-finch, 268
Pieridæ, 501
 Pig :
 Domesticated, 208
 Wild, 208
 Bush, 209
 Earth, 228
 Guinea, 137
 Hedge, 47
 Pigeon :
 Painted, 353
 Nutmeg, 353
 Fruit, 353
 Domestic, 353
 Blue Rock, 353
 Stock Dove, 353
 Ring Dove, 354
 Passenger, 354
 Turtle Dove, 355
 Pig-faced Baboon, 26
 Pigmy Flying Phal-
 anger, 236
 Pigmy Hog, 209
 Pigmy Shrew, 52
 Pig-tailed Macaque, 23
 Pike, 460
 Piked Dog-fish, 444
 Pilchard, 454
 Pill-Millipede, 535
 Pill Wood-louse, 528
 Pilot Fish, 471
 Pine Borer, 507
 Pine Saw-fly, 507
 Pine Sorex, 507
 Pipe Fish, 463
 Pipistrelle Bat, 42
 Pipit, Tree, 280
 Pipit, Meadow, 281
Pisces (Fishes), 441-480
 Plaice, 473
 Plant-lice, 521
Plataleidæ, 345
 Platypus, 242
Platysternidæ, 404
Pleuronectidæ, 472
 Plover :
 Golden, 370
 Ringed, 371
 Kentish, 371
 Grey, 371
 Green, 371
 Egyptian, 398
 Plumose Anemone, 543
 Pochard, 351
 Polar Bear, 107
 Polatouche, 121
 Polecat, 91
 Polecat, Cape, 96
 Pollack, 466
 Polyp, Coral, 543
 Polyp, Fresh-water, 542
Polypomedusæ, 540
 Pope, 467
 Porcupine, 134
 Tree, 135
Porifera (Sponges), 544-
 547
 Porpoise, 223
 Portuguese Man-of-War,
 541
Portunidæ, 523
 Potoroo, 232
 Pouched Animals (*Mar-
 supialia*), 229-241
 Pouched Tree-Frog, 433
 Pouter Pigeon, 353
 Prairie Dog, 122
 Prairie Marmot, 122
 Pratincole, 375
 Prawn, 526
Primates, 6-39
Proboscidea, 144
 Proboscis Monkey, 17
Procellariidæ, 380
Procyonidæ, 100
 Prongbuck, 184
 Prong-horned Antelope,
 184
Proteidæ, 438
 Proteus, 438
Protelidæ, 75
Protozoa (Simplest Ani-
 mals), 547-548
Pseudotrimera, 516
Psittaci (Parrots),
 313-318
Psittacidæ, 314
 Ptarmigan, 357
Ptilonorhynchidæ, 300
 Puff Adder, 423
 Puffin, 382
Pulicidæ, 513
 Puma, 65
 Puss Moth, 503
Pygopodes (Diving
 Birds), 381-385
 Python :
 Reticulated, 425
 Royal, 425
 Indian, 426
Pythoninæ, 425
 Quagga, 157
 Quail, 360
 Rabbit :
 Common, 141
 Dutch, 143
 Flemish Giant, 143
 Angola, 143
 Rock, 144
 Raccoon, 100
Radiata, 538
Raii (Rays and Saw-
 fishes), 447-448
Raididæ, 447
 Rail, Water, 365
 Rail, Land, 365
 Rat, Black, 128
 Rat, Brown, 128
Ratitæ (Flightless Birds)
 387-390
 Rat Kangaroo, 232
 Rat-tailed maggot, 514
 Rat-tailed Viper, 425
 Rattle-Snake, 424
 Raven, 285
 Ray, Electric, 447
 Ray, Sting, 447
 Razor-bill, 383
 Red Admiral Butterfly,
 501
 Red Ant, 509
 Red-backed Saki, 32
 Red-backed Shrike, 295
 Redbreast, 258
 Red Cardinal, 267
 Red Coaiti, 100
 Red Coral, 543
 Red Deer, 190
 Red Dog, 83
 Red-faced Spider Mon-
 key, 29
 Red Fire-fish, 475
 Red Fox, 86
 Red Grouse, 356
 Red Howler, 31
 Red Jungle Fowl, 361
 Red Lemur, 36
 Red Mite, 533
 Red Monkey, 21
 Redshank, 375
 Redstart, 257
 Redwing, 256
 Red Wood-Ant, 508
 Reed Warbler, 265
 Reeve, 375
Regulidæ, 277
 Reindeer, 198
Reptilia (Reptiles), 393-
 428
 Reticulated Python, 425
Rhaphastidæ, 303
 Rhea, 388

- Rhinoceros :
 Indian, 150
 Black, 151
 Sumatran, 151
 Keitloa, 151
 Burchell's, 152
 White, 152
Rhinocerotidæ, 150
Rhinodontidæ, 445
Rhoptoglossa (Chamæ-
 leons), 414-415
Rhopalocera, 500
Rhynchocephalia (Beaked
 Lizards), 428
Rhynchopinæ, 376
Rhynchota, 521
 Rhytina, 216
 Rib-faced Deer, 196
 Rib-nosed Baboon, 28
 Right Whale, 218
 Ring Dove, 354
 Ringed Dotterel, 371
 Ringed Plover, 371
 Ringed Snake, 418
 Ring Ouzel, 256
 Ring-tailed Lemur, 36
 Ring-tailed Phalanger,
 234
 River Crab, 523
 River Horse, 213
 Roach, 457
 Robin, 258
 Rock-fish, 474
 Rock Rabbit, 144
 Rocky Mountain Goat,
 172
 Rocky Mountain Sheep,
 167
Rodentia (Gnawing Ani-
 mals), 118-143
 Roe Deer, 197
 Rolloway Monkey, 21
 Rook, 287
 Rorqual, 219
 Rose-coloured Pastor,
 285
 Rose Saw-fly, 507
 Rough-eyed Caiman,
 399
 Rove Beetle, 517
 Royal Antelope, 184
 Royal Python, 425
 Ruff, 375
 Ruffe, 467
 Ruffed Lemur, 35
 Ruminants, 157
 Running Birds, 387-390
 Sable, 91
 Sable Antelope, 177
 Sacred Baboon, 27
 Sacred Ibis, 345
 Saddle-back Seal, 111
 Saki, 32
 Salamander, 436
Salamandridæ, 436
 Salmon, 450
Salmonidæ, 450
 Salmon Trout, 451
 Sambar, 194
 Sand Badger, 97
 Sand-hopper, 526
 Sand-skipper, 526
 Sand Sole, 474
 Sand Wasp, 509
 Sardine, 454
Saturniidæ, 505
 Saw-fish, 447
 Saw-fly, 507
 Scallop, 490
Scarabæidæ, 518
 Scarlet Ibis, 345
 Scissor-billed Tern, 378
Sciuridæ, 119
Scolopacidæ, 373
Scolopendromorpha, 534
Scombresocidæ, 464
Scombridæ, 470
Scombriformes, 469
Scorpænidæ, 475
 Scorpion, 531
Scorpiones, 531
 Scorpion Shell, 487
 Screamer, 352
Scyphomedusæ, 541
Scylliidæ, 444
 Sea Anemone, 542
 Sea Bear, 115
 Sea-Cucumber, 539
 Sea-Devil, 477
 Sea-Egg, 538
 Sea Elephant, 112
 Sea Horse, 116
 Sea Horse, 463
 Seal :
 Common, 109
 Greenland, 111
 Baikal, 111
 Grey, 112
 Crested, 112
 Monk, 112
 Leopard, 112
 Elephant, 112
 Sea Lion, 113
 Sea Bear, 115
 Sea Parrot, 382
 Sea Perch, 467
 Sea-Pie, 372
 Sea Trout, 451
 Sea-Urchin, 538
 Secretary-Bird, 334
 Sedge Warbler, 266
Selachii (Sharks and
 Rays), 444-448
Semnopithecinae, 15
 Sepia, 486
Sepiidæ, 485
 Serin Finch, 271
Serpentariidæ, 334
 Serow, 171
 Serval, 67
 Sha, 167
 Shag, 337
 Shark :
 Blue, 445
 White, 445
 Basking, 445
 Hammer-head, 446
 Thresher, 446
 Sheep :
 Domestic, 164
 Mouflon, 166
 Barbary Wild, 167
 Argali, 167
 Urial, 167
 Rocky Mountain, 167
 Jungle, 197
 Sheld-duck, 350
 Ship-worm, 491
 Shore Crab, 523
 Short-eared Owl, 320
 Short-tailed Field
 Mouse, 129
 Shoveler, 350
 Shrew :
 Erd, 51
 Pigmy, 52
 Water, 52
 Elephant, 53
 Tree, 54
 Shrike, Red-backed, 295
 Shrike, Great Grey, 295
 Shrimp, 526
 Siamang, 13
 Sickle-billed Humming-
 Bird, 313
 Side-necked Tortoise,
 406
 Silk-Moths, 506
 Silky Marmoset, 34
Silphidæ, 517
Siluridæ, 455
 Silver Fox, 88
 Silver Pheasant, 359
 Silvery Gibbon, 13
Simplicidentata, 140
Simiidæ, 7

- Sing-Sing, 180
Siphonophora, 541
Sirenia (Manatees and Dugongs), 215, 216
Sirenidæ, 438
Sittidæ, 293
 Skate, 447
 Skimmer, 378
 Skipjack, 443
 Skunk, 95
 Skylark, 278
 Skua, 379
 Slender Loris, 37
 Sloth, Three-toed, 224
 Sloth, Two-toed, 225
 Sloth Bear, 106
 Smelt, 452
 Smooth Hound, 444
 Snail :
 Common, 488
 Edible, 488
 Giant, 489
 Pond, 489
 Snake :
 Ringed, 418
 Smooth, 419
 Egg-eating, 419
 Indian Cobra, 420
 Death Adder, 421
 British Viper, 422
 Puff Adder, 423
 Rattle-Snake, 424
 Bushmaster, 424
 Fer-de-Lance, 425
 Reticulated Python, 425
 Royal Python, 425
 Indian Python, 426
 Boa, 426
 Anaconda, 427
 Snake-necked Tortoise, 406
 Snakes (*Ophidia*), 416-428
 Snapper, 468
 Snipe, 373
 Snow Bunting, 274
 Snow Leopard, 63
 Snowy Owl, 321
 Sociable Weaver Bird, 298
 Solan Goose, 337
 Sole, 473
 Solid-horned Ruminants, 190
 Soothsayer, 494
 Sooty Mangabey, 22
Soricidæ, 51
 Sparrow Hawk, 326
 Sparrow :
 Hedge, 263
 House, 270
 Tree, 270
 Spectacled Bear, 104
 Sperm Whale, 220
Sphingidæ, 502
Spinacidæ, 444
 Spider :
 House, 529
 Water, 529
 Garden, 529
 Wolf, 530
 Tarantula, 530
 Bird-eating, 530
 Trap-door, 531
 Spider Crab, 524
 Spider Monkey, 29
 Spinning Mite, 533
 Sponge, 544
 Spoonbill, 345
 Spotted Dasyure, 238
 Spotted Deer, 193
 Spotted Dog-fish, 444
 Spotted Hyæna, 77
 Spotted Salamander, 436
 Sprat, 453
 Springbok, 179
Squali, 444
Squamata, 407-428
 Squid, 486
 Squirrel-like Phalanger, 235
 Squirrel :
 English Red, 119
 Grey, 120
 Black, 120
 Flying, 121
 Ground, 121
 Sugar, 235
 Stag, 190
 Stag Beetle, 518
 Stag's-horn Coral, 543
Staphylinidæ, 517
 Star-fish, 539
 Star-gazer, 479
 Starling, 284
Steganopodes (Cormorants), 336-340
Stercorariidæ, 379
 Sterlet, 450
Sterninæ, 376
 Stick-Insect, 495
 Stickleback, 461
 Sting Ray, 447
 Stoat, 93
 Stock Dove, 353
 Striped Hyæna, 76
 Stonechat, 261
 Stone Crab, 525
 Stone Fox, 88
 Stork, White, 343
 Stork, Marabou, 344
 Stormcock, 254
Striges (Owls), 318-321
 Sturgeon, 449
Sturnidæ, 284
 Sucking-fish, 476
 Sugar Squirrel, 235
Suidæ, 207
Suina, 207
 Surmullet, 468
 Swallow, 282
 Swallow-tailed Butterfly, 501
 Swallow-tailed Moth, 504
 Swan :
 Mute, 348
 Whooper, 349
 Bewick's, 349
 Black, 349
 Swift, 311
 Swift, Esculent, 312
 Swift-footed Crab, 524
 Swimming Crab, 523
 Swine, 208
 Sword-billed Humming-Bird, 313
 Sword-fish, 471
Sylviidæ, 262
Syngnathidæ, 463
 Syrian Bear, 104
Syrphidæ, 513

Tabanidæ, 513
 Taguan, 121
 Tahr, 171
 Tailed Amphibians, 436-438
 Tailless Amphibians, 431-436
 Tailor Bird, 266
 Takin, 171
Talpidæ, 49
 Tamanoir, 226
 Tapir, American, 149
 Tapir, Malayan, 150
Tapiridæ, 149
 Tarantula, 530
 Tarpan, 153
 Tarpon, 454
 Tarsier, 38
Tarsiidæ, 38
 Tasmanian Devil, 238
 Tasmanian Wolf, 239
 Tatouay, 227
 Tawny Owl, 320

- Teal, 350
 Teledu, 97
Teleostei (Bony Fishes), 450-480
Teleostomi (Ganoids and Bony Fishes), 449-480
 Tench, 457
 Tenrec, 53
Tenthredinidæ, 507
 Teredo, 491
 Termite, 498
Termitidæ, 497
 Tern, 377
 Terrapin :
 Land, 403
 Mud, 404
 Alligator, 404
Testudinidæ, 402
Tetramera, 516
Tetranychidæ, 533
Thelphusidæ, 523
 Thick-knee, 372
 Thistle-finch, 269
 Thornback Skate, 447
 Thresher Shark, 446
 Throstle, 254
 Thrush :
 Song, 254
 Missel, 254
 Water, 294
 Thylacine, 239
 Tick, 533
 Tiger, 60
 Tiger Cat, 66
 Tiger-Moth, 503
 Tile-fish, 468
Tipulidæ, 513
 Titlark, 281
 Titmouse :
 Great, 274
 Blue, 275
 Coal, 275
 Marsh, 275
 Long-tailed, 276
 Toad :
 Common, 434
 Natterjack, 434
 Giant, 435
 Midwife, 435
 Surinam Water, 435
 Toddy Cat, 73
 Tomtit, 274
 Toothless Animals (*Edentata*), 224-229
Torpedinidæ, 447
 Tortoise :
 Greek, 402
 Algerian, 402
 Margined, 402
 Brazilian, 402
 Gopher, 402
 Elephantine, 402
 Hinged, 403
 Box-, 403
 Pond, 403
 Big-headed, 404
 Matamata, 406
 Tortoise-shell Butterfly, 501
 Toucan, 304
 Trap-door Spider, 531
Tragulidæ, 202
Tragulina, 202
 Tree Cat, 73
 Tree Creeper, 293
 Tree Frog, 433
 Tree Pipit, 280
 Tree Porcupine, 135
 Tree Shrew, 54
 Tree Sparrow, 270
 Trepang, 539
Tretonidæ, 353
Trichechidæ, 116
 Trichinosis Worm, 537
Trochilidæ, 303
Troglodytidæ, 277
Trombidiidæ, 533
 Trout :
 Sea, 451
 Brook, 452
 Rainbow, 452
 Tropic Bird, 339
 Tsetse-fly, 515
 Tuatera, 428
Tubinares (Albatrosses and Petrels), 379-381
 Tumbler Pigeon, 353
 Tunny, 470
Tupaiidæ, 54
 Tur, 170
 Turbot, 474
Turdidæ, 254
 Turnip Saw-fly, 507
 Turkey, 362
 Turkey, Brush-, 363
 Turkey Sponge, 546
 Turkey-Vulture, 335
 Turtle :
 Snapping, 404
 Green, 405
 Hawksbill, 405
 Leathery, 406
 Turtle Dove, 354
Tylopada, 203
Ungulata (Hoofed Animals), 143-215
 Unicorn Sheep, 165
Upupidæ, 303
 Urchin, 47
 Urchin, Sea, 538
 Urial, 167
Urodela (Salamanders and Newts), 436-438
Ursidæ, 102-108
 Ursine Dasyure, 238
 Urson, 135
 Vampire Bat, 44
Varanidæ, 414
 Variegated Spider Monkey, 29
Vermes (Worm-like Invertebrates), 536-538
 Vervet Monkey, 19
Vespertilionidæ, 42
Vespidæ, 507
Vertebrata, 6-480
 Vicuna, 207
 Viper, British, 422
Viperidæ, 422
 Viscacha, 139
Viverridæ, 72
 Vlacke-Vark, 210
 Vole, Field, 129
 Vole, Water, 130
 Vulpine Phalanger, 234
 Vulture :
 Egyptian, 332
 Griffon, 332
 Lammergeier, 333
 Secretary-Bird, 334
 Californian, 335
 King, 335
 Black Turkey-, 335
 Condor, 335
 Wagtail :
 Pied, 279
 Water, 279
 Yellow, 280
 Grey, 280
 Walrus, 116
 Wanderoo, 23
 Walking-fish, 475
 Wallaby :
 Red-necked, 232
 Hare, 232
 Rock, 232
 Wall Creeper, 293
 Wapiti Deer, 192
 Warble-fly, Ox, 515
 Warbler :
 Blackcap, 262
 Whitethroat, 263
 Hedge Sparrow, 263

Warbler :

Garden, 264
 Dartford, 264
 Chiffchaff, 264
 Wood, 264
 Willow, 265
 Reed, 265
 Sedge, 266

Wart Hog, 209

Wasp :

Sand, 509
 Wood, 519
 Paper, 510

Water Beetle, 517

Waterbuck, 180

Water Buffalo, 162

Waterhen, 366

Water Hog, 137

Water Mole, 242

Water Monitor, 414

Water Ouzel, 294

Water Shrew, 52

Water Snake, 419

Water Spider, 529

Water Thrush, 294

Water Toad, 435

Water Vole, 130

Water Wagtail, 279

Waxwing, 296

Weasel :

Marten, 90
 Sable, 91
 Polecat, 91
 Weasel, 92
 Stoat, 93
 Ferret, 93
 Mink, 94
 Glutton, 94

Weaver Bird, Indian, 297

Weaver Bird, Sociable, 298

Web Spiders, 528

Weeper Sapajou, 31

Weever, Greater, 477

Weevil, 520

Whale :

Greenland, 218
 Rorqual, 219
 Southern Right, 220
 Hump-backed, 220

Whale :

Sperm, 220
 Bottle-nose, 221
 White, 222
 Killer, 223

Wheatear, 261

Whelk, 487

Whinchat, 261

Whirligig Beetle, 517

Whiskered Saki, 32

White Ant, 498

Whitebait, 453

White Bear, 107

White-collared Mangabey, 22

White-fronted Lemur, 36

White-handed Gibbon, 13

White-headed Saki, 32

White-headed Sea Eagle, 328 [212

White-lipped Peccary,

White-nosed Coaiti, 101

White-nosed Monkey, 21

White Pelican, 338

White Rhinoceros, 152

White Shark, 445

White Spoonbill, 345

White Stork, 343

White-tailed Sea Eagle, 329

Whitethroat, 263

White Whale, 222

Whiting, 466

Whooper Swan, 349

Whydah-Bird, 298

Widow-Bird, 298

Wigeon, 351

Wild Ass, 154

Wild Dog, 83

Wild Duck, 349

Wilbeest, 182

Wild Horse, 153

Willow Grouse, 356

Willow Warbler, 265

Wolf :

European, 78
 Indian, 80
 Prairie, 80
 Tasmanian, 239

Wolf, Aard, 75

Wolf-fish, 477

Wolf-Spider, 530

Wolverene, 94

Wombat, 236

Woodcock, 373

Wood Grouse, 356

Woodlark, 279

Wood-louse, 528

Wood Owl, 320

Woodpecker :

Great Spotted, 304

Green, 304

Lesser Spotted, 304

Wood Pigeon, 354

Wood Warbler, 264

Wood Wasp, 509

Wood Wren, 264

Worm :

Blind-, 413

Earth, 536

Lug-, 537

Trichinosis, 537

Wren :

Common, 276

Fire-crested, 278

Gold-crested, 277

Wood, 264

Wryneck, 307

Xiphiidæ, 470

Yaffle, 304

Yak, 160

Yellow Baboon, 27

Yellow Bunting, 273

Yellow Hammer, 273

Yellow Owl, 320

Yellow Wagtail, 280

Zebra :

Mountain, 155

Burchell's, 156

Grevv's, 156

Zebra Wolf, 240

Zebu, 158

Zeidæ, 472

Zorille, 96







